Career Development Interventions And Academic Self-Efficacy And Motivation: A Pilot Study

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CAREER DEVELOPMENT INTERVENTIONS AND ACADEMIC SELF-EFFICACY AND MOTIVATION: A PILOT STUDY

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Supported by
The Office of Vocational and Adult Education
U.S. Department of Education

2003

FUNDING INFORMATION

Project Title:	National Dissemination Center for Career and Technical Education	National Research Center for Career and Technical Education
Grant Number:	V051A990004	VO51A990006
Grantees:	The Ohio State University National Dissemination Center for Career and Technical Education 1900 Kenny Road Columbus, Ohio 43210	University of Minnesota National Research Center for Career and Technical Education 1954 Buford Avenue St. Paul, Minnesota 55108
Directors:	Floyd L. McKinney	James R. Stone, III
Percent of Total Grant Financed by Federal Money:	100%	100%
Dollar Amount of Federal Funds for Grant:	$2,237,615	$2,237,615

Act under which Funds Administered: Carl D. Perkins Vocational and Technical Education Act of 1998 P. L. 105-332

Source of Grant: Office of Vocational and Adult Education
U. S. Department of Education
Washington, D.C. 20202

ABSTRACT

In the Foreword to his education plan for the nation, *No Child Left Behind,* President George W. Bush noted 2 student sentiments as key causes of academic failure. These sentiments were low expectations and self-doubt. This pilot study examines the relationship between participation in career development interventions and the inverse of these sentiments—academic motivation and academic self-efficacy. A nationwide sample of 293 youth from 20 high schools was assessed on a variety of variables including academic motivation, academic self-efficacy, and participation in 44 clearly defined career development interventions. Consistent with previous research, this pilot study found little or no predictive relationships between level of participation in the interventions and academic motivation or self-efficacy. However, unlike previous studies, the specific dosage of each of the 44 interventions was assessed. This assessment revealed very low dosage rates across all interventions and all students. The implications of this pilot study for an evidence-based research agenda concerning career development interventions was discussed.

EXECUTIVE SUMMARY

Since Frank Parsons, American educators have exuded a strong passion for the idea that career development interventions can enhance student academic growth. Indeed, the entire profession of school counseling was developed in the United States for the purpose of helping students articulate for themselves the link between academic achievement and career development.

While American educational theorists have been strong promoters of the linkage between career development interventions and intellectual growth, American educational researchers have not. Research studies from the Career Education era, forward, have not established a firm connection between career development interventions and academic achievement. However, these studies noted that the failure to find such a connection could be due to the ill-defined nature of the independent variable. Most often, the independent variable was simply labeled "career development," with no further specificity. To remedy this methodological gap in career development intervention research, a pilot study was conducted to assess student participation in 44 specifically defined interventions. The participation level for each intervention was then combined into 4 career development intervention taxon scores.

To understand the relationship between career development intervention participation and academic achievement, the taxon-level participation scores were regressed against key psychological mediators of academic achievement —academic self-efficacy and academic motivation. These psychological mediators were selected as the criterion variables because of the ample and robust research evidence linking to academic achievement. In addition, psychological variables were selected given their potential to be leveraged with the skills school counselors and other career and technical education professionals commonly employ.

As self-efficacy and motivation are domain-specific, separate regression analyses were run for English self-efficacy, English motivation, mathematics self-efficacy, and mathematics motivation. Despite the precise definition of the independent variables, minimal linkage was found between the career development intervention taxa and self-efficacy and motivation. The one exception was that the Advising intervention taxon predicted 4% of the variance in mathematics motivation. Given the common limitations of pilot studies active in the study (e.g., convenience sampling, retrospective measures), the reasons for not finding practically meaningful results are undeterminable.

However, the precise definition of the predictor variable did provide an unexpected bonus. Across all of the students participating in the study, the dosage administered was quite small for each of the 44 interventions. While there is not much literature on dosage-effect with career development interventions, the few existing studies (i.e., Kadera, Lambert, & Andrews, 1996; Myers, Lindeman, Thompson, & Patrick, 1975; Oliver & Spokane, 1998) suggest that the average dosage administered was far below the level needed to affect the psychological mediators of academic achievement.

These findings have implications for future research. Specifically, it suggests a need for refocusing research efforts. Instead of focusing on large, macro-level studies that attempt to link the whole field to multiple student outcomes, the findings suggest adopting the evidence-based research approaches used in the medical sciences. In particular, each career development intervention could be studied by increasing its dosage until a pre-specified outcome is achieved or noxious side effects become so prevalent as to warrant abandoning the intervention.

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INTRODUCTION

"The quality of our public schools directly affects us all—as parents, as students, and as citizens. Yet too many children in America are segregated by low expectations, illiteracy, and self-doubt. In a constantly changing world that is demanding increasingly complex skills from its workforce, children are literally being left behind."

—President George W. Bush
Foreword, *No Child Left Behind* (2001)

Since Parsons (1909), American educators have supported the idea that career development interventions can promote student academic growth by addressing problems such as low expectations and self-doubts. Therefore, educational interventions that foster the career development of students and facilitate academic progress are both time-honored and vital to achieving the goals of education for the new century. As a pilot study, this research project seeks to explore the association of career development interventions to self-efficacy and student motivation. As will be explained in detail in the Literature Review section, present research supports a strong link between improved academics and increased self-efficacy and motivation. However, research addressing the relationship of career development interventions and academic achievement (including prime mediator variables such as self-efficacy and motivation) is not as clear.

Rationale for Present Research Project

Why investigate the impact of career development interventions on academic self-efficacy and motivation, rather than other outcomes? There are five primary rationales for this choice: (a) career development is an integral part of academic planning, (b) the influence of labor market trends on work availability and preparation, (c) government pressure to increase efficiency in education, (d) the lack of improvement in reading and math achievement of students, and (e) the relationship of self-efficacy and motivation to academic achievement is strongly supported by previous research.

Career Development as Academic Planning

Career development is an integral part of academic planning. Most certainly, without adequate self-knowledge and awareness of the connection between their academic endeavors and futures, students lose track of school's purpose. Consequently, those who feel a lack of relevancy regarding their schooling often do not expend much effort at school, and many even drop out of school. Identifying effective career development interventions has the potential to illumine the purpose of school for students, and make educational planning meaningful.

In the current labor market, educational planning for students is essential for their future success after high school. Gray (2000) noted that the ability to plan is often associated with career maturity: "Postsecondary success depends on both academic skills and commitment, which come from career maturity and direction" (p. 124).

Labor Market Trends

Due to changes in labor market trends, both career development and academic achievement have increasing importance. In 1970, male high school graduates earned an average of $35,553, while, in 1998, they earned $25,864—substantially less. Females made a small gain—earning $15,356 in 1998, as opposed to $14,681 in 1970. Of those holding bachelor's degrees, both sexes earned nearly twice as much as high school graduates (U.S. Department of Education, 2000).

However, a university degree does not guarantee professional occupations and high wages. Only 23% of future jobs are projected to require preparation at the undergraduate or graduate school level (Gray, 2000). For the current high school generation, many of the fastest growing occupations will be in technical areas and require only postsecondary training. Only 25% of technical employment requires a university degree, and this percentage is not projected to change (Gray, 2000). It is estimated that by 2006, 43% of university graduates will be *underemployed* (i.e., in vocations not requiring a college degree) (Gray, 2000). It is no longer true that simply earning a college degree will lead to a good job with high wages. Clearly students will need to actively engage in their own career development as part of the educational process. To best serve students, career development interventions need to be appropriate to the changing labor market.

There is a misconception in some educational circles that assisting in a student's career development is futile. The rationale is that individuals change jobs frequently throughout their lifetime and the labor market fluctuates. Given this perspective, it is important to discern the difference between a "job" and a "career." A career can be conceptualized as a series of related jobs over time, organized around a particular knowledge base and set of skills (Gray, 2000). While holding multiple jobs is expected, multiple careers are often indicative of a troubled work history, and associated with lower earnings. Thus, it is important both socially and economically to help students gain the career maturity needed to achieve a stable career pattern in life.

Fiscal Responsibility in Education

There are significant fiscal reasons why the impact of career development interventions on academic achievement should be explored. In 1992, 43.2 million students were in grades 1–12 (U.S. Department of Education, 2000). It is projected that this will increase to 44.4 million students by the year 2006. With over $6,000 spent per student in public education, this makes K–12 education a trillion-dollar industry. Approximately $259 trillion dollars, in fact.

As with other areas of education, career guidance personnel have a fiscal responsibility to make sure that the interventions in schools are worthwhile. Currently there is not enough knowledge in the field to determine which interventions work best. Yet, schools continue to make large financial investments in career development interventions without fiscal awareness.

Lack of Improvement in Reading and Math Achievement

The lack of improvement in academic achievement, particularly in the realm of reading, suggests that educational endeavors (career development included) should be aimed at academic achievement. In 1998, 60% of the 12th grade students performed below proficiency level in reading (U.S. Department of Education, 2000). This performance level has remained unchanged since 1992, possibly indicating that the current organization and implementation of educational interventions are not having a substantial impact on increasing reading achievement.

Reading achievement (a function of English motivation and English self-efficacy) is important across subjects in the high school curriculum. Whether solving story problems in math, learning safety procedures in applied technology, or studying ancient Greek myths, a student's reading achievement level has substantial influence on all subsequent achievements across multiple content areas. Hence, the subject of English is of central importance in American education (Riley, 2000).

Self-Efficacy and Motivation Linked to Academic Achievement

A substantial amount of research has established the connection of self-efficacy and motivation to academic achievement. Researchers have consistently demonstrated that self-efficacy predicts students' mathematics performance (Bandura, 1986; Pajares, 1996a; Pajares & Miller 1995). There is additional empirical support from linking motivation and self-efficacy to reading and writing achievement (Multon, Brown & Lent, 1991; Pajares & Johnson, 1996; Shell, Bruning and Murphy,

1989; Wigfield & Eccles, 2000; Wigfield, Eccles, MacIver, & Reuman, 1991; Wigfield et al., 1997). Such a strong body of research lends substantial support to the use of self-efficacy and motivation as mediator variables for academic achievement.

This last point is perhaps the strongest argument in favor of this investigation. Recent reforms in education have placed a greater emphasis on learning academic skills in the areas of math and English (Cuban, 1998; Herrera & Owens, 2001). Therefore, the recognition of interventions that increase academic achievement while simultaneously addressing vocational success have become increasingly imperative. Furthermore, the educational agenda of the new federal administration seems to place a high priority on accountability of educational interventions in contributing to academic improvement. Unmistakably, answering research questions about the relationship of career development interventions to self-efficacy and motivation becomes imperative.

Research Questions

This study investigates two main research questions:

1. Beyond the background variables of gender, race/ethnicity, parent educational level, socioeconomic status (SES), and prior achievement, what is the predictive value of career development interventions to academic self-efficacy?

2. Beyond the background variables of gender, race/ethnicity, parent educational level, SES, and prior achievement, what is the predictive value of career development interventions to academic motivation?

Glossary

This research report uses a wide variety of specialized terms. A glossary of these terms can be found in Appendix B.

LITERATURE REVIEW

There has been an increasing emphasis on educational reform in recent years, and a growing emphasis on career development as part of educational reform (Drier & Ciccone, 1988; Gysbers, 1992; Gysbers & Henderson, 2000; Herr, 1992). Yet, some critical questions remain unanswered, and the direction for research is still unclear. Some important questions that emerge include the role of career development in academic achievement. Specifically, what career interventions are most effective with students, with what types of problems, and at what point in their career development?

In order to investigate these questions, it is first necessary to understand the current research knowledge surrounding the relationships among career development, academic motivation, and academic self-efficacy. This section will define and discuss the constructs self-efficacy and motivation. Following the explanation of these constructs, there will be a brief description of the career development taxonomy study that created the four taxa under investigation in this study. In addition, this literature review will trace the development of career development intervention research from the 1970s through the 1990s. After exploring the historical perspective, the section will focus on four meta-analyses that investigate the impact of career development interventions. More recent research examining career development interventions at the K–12 level will then be explored, and studies on the impact of career development programs will be reviewed. Recent research relevant to the constructs self-efficacy and motivation will be presented.

Overview of Constructs

A definition of the constructs self-efficacy and motivation is essential to understanding the foundational research relevant to this research report. Similarly, it is useful to have knowledge of the career development taxonomy study that established the predictor variables of this study. Once there is an understanding of the constructs motivation and self-efficacy, as well as background knowledge on the creation of the career development taxonomy, the connection between previous research and the current study becomes evident.

Self-Efficacy

The construct self-efficacy evolved out of Bandura's (1977, 1986) social cognitive model of behavior, and has progressed into a theory in its own right. According to Bandura (1997), the consequences of one's past behaviors significantly influence future behavior through the informative and incentive values of those consequences. It is the interaction between the individual and environment that causes behavior. The individual's perceptions, then, play a key role in this process—especially the perception that there is personal efficacy in exercising influence over what they do and what happens to them. "In social cognitive theory, a sense of personal efficacy is represented as prepositional beliefs" (Bandura, 1997, p. 3). Self-efficacy is a major construct in social cognitive theory, and these prepositional beliefs contribute to how people plan goals and execute courses of actions to achieve objectives. Additionally, an individual's self-efficacy contributes to motivation for performance. "Beliefs of personal efficacy also regulate motivation by shaping one's aspirations and the outcomes expected for one's efforts" (Bandura, 1997, p. 35).

In Bandura's model, self-efficacy is defined as, "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). In this view, perceived competence includes both behavioral actions and cognitive skills necessary for performance in a specific domain. "Perceived self-efficacy refers to belief in one's power to produce given levels of attainment" (Bandura, 1997, p. 382).

The construct self-efficacy is incorporated into an expectancy construct, but there are some important underlying distinctions. "Perceived self-efficacy is a judgment of one's ability to organize and execute given types of performances, whereas an outcome expectation is a judgment of the likely consequence such performances will produce" (Bandura, 1997, p. 21). Though distinct, because outcome expectation is contingent on beliefs in one's ability to produce a given outcome, the constructs expectations and self-efficacy are in agreement with each other.

Motivation

There is no clear consensus on how to define and set parameters for the construct motivation (Ford, 1992). The concept of motivation is inherently broad and multi-faceted (Ford). Any operational definition runs the risk of using an overly simplified and consequently useless set of theoretical underpinnings. This research project will therefore limit itself to the Expectancy-value theory of goal-directed behavior as the foundation for an operational definition of academic motivation. Wigfield and Eccles (2000) state that "theorists in this tradition argue that individuals' choice, persistence, and performance can be explained by their beliefs about how well they will do on the activity and the extent to which they value the activity" (p. 68). Expectancy-value theory posits that goal-directed behavior is a function of (a) expectations—the belief that performance is contingent on effort and that performance will determine the outcome, and (b) the value that a person attaches to that outcome (Shepperd & Taylor, 1999; Wigfield & Eccles, 2000). Other theories of academic motivation were considered (Covington, 2000; Pintrich & Schunk, 1996; Skinner, 1953; Zimmerman, 2000) but were rejected in favor of the Expectancy-value theory. The Expectancy-value theory of academic motivation was selected for use as a construct definition in this research project because it incorporates both student values of tasks as well as self-efficacy beliefs regarding domain-specific behaviors.

Career Development Interventions

In this research project, the aforementioned four-cluster taxonomy of career development interventions will be employed. Dykeman et al. (2001a, 2001b) developed a comprehensive career development intervention taxonomy. Through extensive consultation with career development practitioners and researchers across the United States, a comprehensive list of 44 career development interventions that occur in secondary schools was compiled. In a survey, the 44 career development interventions were then rated across 5 variables (time, mode, control, place, and size) by a random sample of the Guidance Division of the Association for Career and Technical Education. A cluster analysis was completed on the ratings, and a four-taxa solution was produced. The four taxa are: Field, Advising, Introductory, and Curriculum. The Field taxon consists of career development interventions that occur in the community as opposed to interventions that occur within the school. The Advising taxon is comprised of interventions that are designed to provide the student with direction for education and occupational planning. Interventions designed to make students aware of career options and the need to plan for life after school are in the Introductory taxon. Finally, the Curriculum taxon includes interventions with formal and informal instruction designed to build foundational work skills and knowledge in students.

Research Literature on Career Development Intervention Predictor Variables

In order to understand the current state of research in the area of career development, it is important to understand the historical evolution of research in career education. This understanding frames the foundation and challenges of more recent research regarding career development interventions.

Historical Perspective

In the 1970s, researchers began to investigate the effects of career education on academic achievement. Guiding this research movement were the 10 learner outcomes established by the Office of Career Education (i.e., a bureau of the Office of Education, U.S. Department of Health, Education, and Welfare). The first learner outcome had two parts that focused directly on academic achievement. The exact text of this outcome is as follows:

> *Learner Outcome # 1-a*. Competent in the basic academic skills required for adaptability in our rapidly changing society (Reading Achievement).
>
> *Learner Outcome # 1-b*. Competent in the basic academic skills required for adaptability in our rapidly changing society (Mathematical Achievement; Hoyt, 1980, p. 23).

A number of studies on Learner Outcome #1 were completed during the course of the federal legislation that sponsored career education. Bonnet (1977) examined over 500 student outcome studies from over 45 programs. She found compelling evidence of career education's positive impact on academic achievement in selected incidents. Similarly, Bhaerman (1977) examined over 38 studies that focused on mathematics achievement and/or reading achievement and career education. Reflecting Bonnet's assertions, Bhaerman concluded that career education did not have a negative impact on student achievement, as popularly held by teachers and administrators. In fact, Bhaerman reported that 19 of the studies indicated that career education positively affected either reading or mathematics at the .05, .01, or .001 level of statistical significance.

In 1980, Hoyt synthesized these research findings along with additional reports in his evaluation of K–12 career education. An evaluation of the findings of over 114 studies and a review of 257 career education sites drew the conclusion that career education efforts most often produce positive results.

Career education research, however, was hindered by problems of, (a) lack of agreement on acceptable measures of outcomes, and, (b) poor consistency in definitions of "treatment" as well as "delivery" (Bhaerman, 1977). The literature established that career education appeared to promote student achievement. However, the research contained many methodological problems (Bhaerman, 1977; Bonnet, 1977; Hoyt, 1980).

Outlining directions for the 1980s, Hoyt identified four key issues for researchers. The first involves the career education treatment. In evaluating career education efforts, a definition of the treatment must be specific and clear. Moreover, how and when this treatment is delivered must be equally apparent. Second, intermediate criteria must be developed to make it possible to measure the developmental, longitudinal nature of career education (Hoyt, 1980). The third issue involved establishing and using proper control groups in evaluation designs. Lastly, Hoyt pointed to the issue of the teaching and learning process. He noted that, in addition to infusing purposefulness and meaning into the teaching/learning process, as good teachers are already apt to do, using a project–activity-oriented approach to help students acquire decision-making skills, combined with cognitive and experiential approaches to learning would support their responsibility to be career oriented.

Since the 1970s, researchers have investigated additional benefits of career education for students. There is substantial evidence to support the assertion that vocational education lowers the dropout rate and increases the retention of students (Bishop, 1987; Brown, 1998). Vocational Education has been shown to raise employment rates and earnings of at-risk youth (Brown, 1999), and to have substantial labor market payoffs for high school students (Bishop, 1987). It has been maintained that career development interventions are an essential part of career education (Bishop,

1987; Drier & Ciccone, 1988; Gysbers, Lapan, Blair, Starr, & Wilmes, 1999; Henderson & Gysbers, 1998; Herr, 1992; Herr & Cramer, 1992; Lapan, Gysbers, & Sun, 1997; Lieberman, 1988; Loughead, Liu, & Middleton, 1995; Marsh & Codding, 1999). Yet, what career development interventions are most effective? What, if any, is the impact of career development interventions on students' academic achievement? This literature review examines recent research in light of these important questions.

Career Development Intervention Meta-Analyses

Several extensive meta-analyses have been done regarding career interventions. Bucknam and Brand (1983) conducted a meta-analysis on the effect of experience-based career education (EBCE) by examining EBCE programs from 1976 to 1982. Their meta-analysis of 80 programs determined that those students from all socioeconomic levels and all residential areas that were exposed to EBCE made larger gains in academic skills and career skills than did students in the typical high school curriculum. Even low fidelity to the proven models of EBCE showed better results on academic skills outcomes than did the regular high school curriculum (Bucknam & Brand, 1983). These results are tempered by the fact the study was published in a non-peer reviewed journal. Also, the article fails to describe any of the statistical analyses conducted for the meta-analysis.

Oliver and Spokane (1988) conducted a meta-analysis of 58 studies from 1950 to 1979. In 247 treatment-controlled comparisons of 58 studies involving 7,311 subjects, Oliver and Spokane examined the various effect sizes on client outcome variables. The outcome variables included aspects of career decision making such as accuracy of self-knowledge, career salience, and career information seeking. Aspects of effective role functioning such as academic performance, career related knowledge, and interview skills were also included. Findings indicated a significant average effect size of .82 (Cohen, 1977).

Oliver and Spokane (1988) also examined the effect size of career interventions relative to different treatment modalities and by number of sessions. Individual counseling was found to have the largest effect size per hour (*ES* = .52), followed by workshops/structured groups (*ES* = .13), and group counseling (*ES* = .08). A mean effect size of 5.11, 2.73, and 1.19 was found for 20, 7, and 6 sessions, respectively. Their findings indicated clear differences in intervention modes and number of sessions, suggesting 7 sessions are much more effective than 6, and that increasing to 20 sessions can nearly double effect on client outcome.

In 1998, Whiston, Sexton, and Lasoff conducted a replication of Oliver and Spokane's 1988 study. They examined studies published from 1983 to 1995 using a sophisticated coding system and extensive data analysis. Their investigation involved 268 treatment control contrasts from 47 studies that involved 4,660 participants. Whiston et al. examined the same outcome variables organized into the same categories of career decision making, effective role functioning, and counseling evaluation. A smaller average effect size of .45 was found, which differed from Oliver and Spokane's previous findings by less than half a standard deviation (Whiston et al., 1998).

Effect size per hour calculations yielded some interesting differences from Oliver and Spokane. Individual counseling was still the highest treatment effect size at .92, but the second-most-effective treatment was computer interventions (*ES* = .23), followed by class interventions (*ES* = .08). Wide variations in the services provided within each treatment category exist, which may inhibit the ability of the type of treatment to predict effect size. Therefore, the treatment categories may need to be more specific.

Unlike Oliver and Spokane (1988), Whiston et al. (1998) did not find treatment intensity (i.e., number of hours plus number of sessions) a significant predictor of the magnitude of the effect

size. However, Whiston et al. noted that their non-significant results were most likely an artifact of their methodology.

Evans and Burck (1992) conducted a meta-analysis on career education interventions and their effect on academic achievement. Unlike the previously mentioned studies that included participants of all ages, Evans and Burck looked only at studies involving K–12 students as participants. Academic achievement was measured by student achievement on standardized and criterion-referenced tests administered following career education interventions. Selection was limited to those research studies that included a control group. The literature search spanned from 1966 through March of 1986. An overall effect size of .16 was found, indicating a small (Cohen, 1977) positive effect size. Thus, the conclusion was that career education produces a positive gain in academic achievement as compared to when students receive no career education interventions.

Baker and Taylor (1998) found an even stronger effect of career education interventions in their meta-analysis of 12 studies from 1983 to 1996. Using strict criteria, they only included studies that were: experimental/quasi-experimental with treatment and control groups, were published in refereed journals, and had participants from grades K–12. Eleven of the 12 studies indicated a positive effect of career education on student outcomes. Combining these 12 studies with 18 studies from 1970–1982 yielded an estimated effect size of .39 for the 30 studies. According to Cohen (1977), this is between a small and medium positive effect size.

Recent K–12 Career Development Intervention Studies

Research at the Middle School Level

Several studies have investigated the impact of career guidance interventions on middle school students (Lapan & Jingeleski, 1992; Luzzo & Pierce, 1996; Mau, 1995; Peterson, Long, & Billups, 1999). Though there are a limited number of studies with this age group, researchers have found positive results.

Evaluating the effects of a computer guidance system (i.e., DISCOVER) on middle school students, researchers (Luzzo & Pierce, 1996) found a statistically significant, positive increase in career maturity. Other studies present evidence that educational planning and aspirations are closely related to current academic achievement (Mau, 1995).

Peterson et al. (1999) explored the effects of career interventions on the educational choices of eighth grade students who were transitioning to high school. Researchers implemented three levels of career interventions for students. Level one was an announcement in social studies classes by a member of the middle school guidance staff, instructing students in completing a trial high school program of study. Level two consisted of level one with the addition of printed materials, including graduation requirements, examples of a college prep curriculum, and a vocational prep curriculum. The third level involved a computer-assisted classroom instruction that was designed to foster career problem-solving and decision-making skills by enhancing self-knowledge, occupational knowledge, and decision-making skills, as well and metacognitive skills.

One instrument designed to measure these outcomes was a career grid that measures students' occupational preference or interest and desired educational level. The career grid requires students to identify areas of preferred interest, career aspiration, and desired occupational level, and was given to groups in each level, of intervention as pretest and posttest measures. An increase in these areas was the desired outcome, but a statistically significant difference did not occur in pre–post measures.

The completion of an educational 4-year plan was also used as a measure to evaluate the effects of the different levels of career intervention. The 4-year plan was examined for specificity, appropriateness, and sequence. A chi-square analysis revealed treatment effects regarding a significantly greater number of students in the level two and three treatment groups achieving mastery at post-test with the career grid and 4-year plan. Only 54% of the level one students met the criteria of specificity, appropriateness, and sequence in the 4-year plan, as compared to 100% of the level three students.

Research at the High School Level

Studies at the high school level exhibit similar findings to studies at the elementary and middle school levels. Some research has shown that incorporating career guidance into the academic curriculum can lead to positive outcomes for students (Hughey, Lapan, & Gysbers, 1993; Lapan, Gysbers, Hughey, & Arni, 1993). Lapan et al. (1993) found that a program fusing a career guidance and language arts unit significantly increased both the vocational identity scores and the English GPAs of high school juniors. Hughey et al. (1993) found in their qualitative study of 25 high school juniors that these students reported a better knowledge and understanding of the career decision making process, as well as increased confidence in the career planning process.

Another form of research examining the efficacy of career guidance interventions is by means of program evaluations (Cawelti, 1999; Loughead et al., 1995). Career development educational programs such as PRO 100, a career development program for impoverished inner-city youth, have demonstrated the ability to improve students' career planning ability and job search skills (Loughead et al., 1995).

Comprehensive Guidance Program Studies

Comprehensive guidance programs are educational programs designed to assist students with career development, academic/educational planning, and other student competencies. Such programs are often based on the Missouri Comprehensive Guidance Model (Gysbers & Henderson, 2000), which organizes services around four components: (a) a guidance curriculum, such as classroom presentations, (b) individual planning, such as advising, (c) responsive services, such as individual/group counseling, and (d) system support, such as consultation with teachers/ administrators. These structural components are adapted and implemented according to the desire of given schools/districts.

Studies have assessed the impact of career guidance programs in high schools (Gysbers, Hughey, Starr, & Lapan, 1992; Gysbers et al., 1999; Hotchkiss & Dorsten, 1985; Lapan et al., 1997; Whiston & Sexton, 1998). Some of these studies have taken a more extensive approach toward examining the influence of career interventions by investigating them within the context of a comprehensive guidance program delivery model (Gysbers, 1992; Gysbers & Henderson, 2000; Henderson & Gysbers, 1998).

Hotchkiss and Dorsten (1985) researched the effects of career guidance programs on five outcomes: locus of control, self-esteem, perceived ability to complete college, educational expectation, and occupational expectation. Students attending schools with active guidance programs and students not attending such schools were compared across these five outcomes. Incidentally, attending a school with an active career guidance program did not demonstrate much effect on the five outcome variables (Hotchkiss & Dorsten, 1985).

Lapan et al. (1997) conducted a statewide evaluation of the implementation of comprehensive guidance programs and their subsequent effects on student outcomes. Data from 22,964 students in 236 high schools were evaluated using a previously established framework for measuring outcomes (Gysbers et al., 1992). The study established four outcomes to investigate: (1) if student

achievement was enhanced in schools with more fully implemented, comprehensive guidance programs, (2) if all students would benefit from the program irrespective of gender, ethnicity/racial status, school size, and socioeconomic level, (3) if there is a direct link between fully implemented programs and student perceptions of a more positive school climate, and (4) if there is a connection between increased availability of career information and "enhanced student expectations that their school experiences were adequately preparing them for their future" (Lapan et al., 1997, p. 293). After removing effects of school size, socioeconomic status, and minority student attendance, results indicated that students enrolled in schools with more fully implemented, comprehensive guidance programs reported earning higher grades. Interestingly, self-reported student GPA may not be the most valid measure of academic achievement.

Whiston and Sexton (1998) conducted a major review of the school counseling outcomes research from 1988 to 1995, and noted significant research methodology problems. Therefore, it was difficult to draw any definite conclusions about the relationship between guidance and academic achievement. However, there do seem to be some additional benefits to guidance program implementation. Students attending schools with more fully implemented guidance programs indicated that they found the quality of their education adequately prepared them for their future. A more positive school climate and greater feelings of safety and belonging were also reported (Gysbers et al., 1999).

Sink and MacDonald (1998) investigated the national trend toward development and implementation of comprehensive guidance and counseling programs. They conducted a nationwide survey, and determined that 24 states had produced some type of comprehensive guidance and counseling model. An additional 17 states either have a model under development or allow individual districts to create guidance programs. Only 11 states, however, include a guidance curriculum in their models, and all the state models seem to inherently lack a developmental emphasis. After further investigating the content of guidance programs, MacDonald and Sink (1999) found that comprehensive guidance and counseling programs were weak on developmental attention. In particular, guidance programs did not seem to address cultural development issues. Additionally, the researchers found that within the models, tasks were not well-grounded in theory. Moreover, developmental levels were unclear and did not have consistency within or across models. In most of the models, developmental components such as personal–social, cognitive, and career development were not integrated in any thorough or systematic manner.

Assuming career development interventions are important but possibly lacking in organized application, how do the school counselors feel about program implementation? Gysbers et al. (1999) conducted a survey of 430 school counselors in Missouri. The school counselors were asked to evaluate the extent to which their district had implemented a district-wide comprehensive guidance program. Counselors were asked what changes in their roles had taken place, and to what extent non-guidance tasks were eliminated from their current duties. The survey results indicated that 80%–96% of the school counselors reported the major program components were in place, and two-thirds reported that they had the means available to carry out the program. Many thought that significant changes in their roles had taken place, but most indicated that non-guidance tasks had not been reduced or eliminated. These responses seem to suggest that, while students feel greater satisfaction about career guidance services, school counselor duties have not significantly changed.

So what decisive conclusions can be drawn from the research on career development interventions? It is difficult to draw clear conclusions from the research in this area. The literature on career development interventions does support several points: (1) as the research from the 1970s illustrates, career development interventions do not harm students or inhibit their educational progress in academics, and (2) recent research indicates that career development interventions contribute to a variety of positive student outcomes, including career planning abilities, career

decision making, job search skills, and even increased academic performance (e.g., Lapan, Gysbers, & Sun, 1997). However, these positive findings do not overcome the longstanding research methodology problems discussed earlier.

There are several unique challenges in attempting to investigate career development interventions. Current research is still hindered by a poor definition of treatment in some studies. There is also a lack of a consistent definition in what constitutes a career development intervention in some studies of guidance programs and vocational education. Many studies that have investigated academic achievement have attempted to link career guidance or other educational programs directly to academic achievement, without determining specifically which interventions provide leverage for academic achievement. The investigation of intermediary processes to academic achievement, such as academic self-efficacy and motivation, could serve to remediate this gap.

It is clear from the literature review on guidance programs that the foundational research around career development is lacking. The lack of a foundation establishing the connection between career development interventions and academic achievement, or various other positive student outcomes, inhibits the direction of future research. Subsequently, there is a significant gap from the lack of outcomes studies with clear findings.

Intervention Participation Rates

Delci and Stern (1999) reported on career development intervention participation rates using the 1997 National Longitudinal Study of Youth (NLSY97). The career development interventions studied and the student participation rates can be found in Table 1. Levesque et al. (2000), using data gathered from the 1990 and 1994 National Assessment of Education Progress High School Transcript Studies, reported that almost all school graduates (i.e., 97%) complete at least one CTE course.

Research Literature on the Criterion Variables

As illustrated in the Introduction section, there are several convincing reasons for exploring the association of career development interventions to level of academic self-efficacy and academic motivation, rather than other criterion variables. As explained previously, these reasons include: (a) career development is an integral part of academic planning, (b) labor market trends, (c) fiscal responsibility in education, (d) the lack of improvement in reading and math achievement of students, and (e) the relationship of self-efficacy and motivation to academic achievement is strongly supported by previous research. The next sections of the Literature Review examine the research on the topics of self-efficacy and motivation, as related to academic achievement.

Self-Efficacy

The literature around self-efficacy as a construct has a stronger research foundation (i.e., greater consistency and clearer results) than the literature on career development. This section outlines the predominant research on self-efficacy, particularly as it relates to academic achievement. Special emphasis will be placed on exploring the research on self-efficacy as it relates to math and English achievement.

The research review will follow chronological order whenever practical. Due to the enormous quantity of research in the area, only the most relevant and substantial studies will be detailed. Self-efficacy is hypothesized to affect task choices, effort expended, persistence, and achievement (Bandura, 1997). This literature review of the construct self-efficacy will focus primarily on self-efficacy in the academic realm. The research investigating self-efficacy and academic outcomes is organized into the categories of (a) self-efficacy and general academics, (b) self-efficacy and mathematics, and (c) self-efficacy and English.

Self-Efficacy and General Academics

In 1977, Bandura published an article proposing a theory of personal efficacy. He sought to explain the origins, mediating mechanisms, and impact of beliefs on expectations of personal efficacy. Bandura (1977) posited that "psychological procedures, whatever their form, serve as a means of creating and strengthening expectations of personal efficacy" (p. 193).

Perceived efficacy is the construct of self-efficacy that came to be defined as a person's judgments of one's capabilities to organize and execute courses of action to attain designated goals (Bandura, 1977, 1997; Zimmerman, 2000). In an academic setting, a student's self-efficacy beliefs refer to their judgments of confidence to successfully perform academic tasks (Pajares, 1996b, Pajares & Graham, 1999; Schunk, 1991, 1995). With regard to their content, self-efficacy measures focus on academic performance capabilities rather than psychological characteristics (Zimmerman, 2000). The focus of self-efficacy in academic settings has been on mastery criterion of performance.

Numerous studies have investigated the relationships among efficacy beliefs, academic motivation, and achievement. These studies have reported that self-efficacy beliefs are correlated with motivation constructs, academic choices, changes, and achievement (Pajares, 1996b). There is evidence that self-efficacy "predicts such diverse outcomes as academic achievements, social skills, smoking cessation, pain tolerance, athletic performances, career choices, assertiveness, coping with feared events, recovery from heart attack, and sales performance" (Schunk, 1991, p. 208).

Schunk has conducted and reported on numerous studies that have explored self-efficacy beliefs in a variety of academic contexts (Schunk, 1982, 1984a, 1984b, 1989, 1991, 1994, 1995; Schunk & Cox, 1986; Schunk & Gunn, 1985; Schunk & Hanson, 1989a, 1989b). These studies underscore the significant role of self-efficacy beliefs in the learning process. Investigating the role of modeling and self-efficacy, Schunk gave low-achieving children either cognitive modeling or didactic instruction. Both methods raised self-efficacy equally well, but cognitive modeling led to greater gains in skill. Regardless of the treatment condition, self-efficacy related positively to both persistence and achievement.

In academic settings, self-efficacy beliefs have been shown to be predictive of two measures of student effort: rate of performance and expenditure of energy (Zimmerman, 2000). Salomon (1984) found self-efficacy to be positively related to self-rated effort and achievement with text material that was perceived as difficult. Schunk (1981) conducted path analyses that show self-efficacy influences skill acquisition both directly and indirectly through persistence. Lastly, a heavy emphasis in researching self-efficacy in academic settings has been on self-regulation of learning. In this area, the predominant thinking is that "self-efficacy beliefs also provide students with a sense of agency to motivate their learning through use of such self-regulatory processes as goal-setting, self-monitoring, self-evaluation, and strategy use" (Zimmerman, 2000, p. 87). Myriad research supports the effect of self-efficacy on the four self-regulatory processes (Multon et al., 1991; Pintrich & Schunk, 1996; Schunk, 1994).

Much of the research in self-efficacy is task-specific within academic content areas. Generally speaking, "one line of inquiry has assessed judgments of self-efficacy in terms of particularized self-perceptions of competence highly consistent with the criterial task being assessed" (Pajares, 1996b, p. 547). This approach makes sense, as more global attempts to measure self-efficacy tend to lower the explanatory power of self-efficacy in academic achievement, as compared to investigating self-efficacy in domain-specific areas.

Bong (1999) made several important discoveries when investigating personal factors affecting academic self-efficacy judgments. Girls' self-efficacy perceptions were more subject-specific than

boys, and girls in particular showed greater differentiation between verbal and math subjects. Additionally, Bong found that Advanced Placement students were also more discriminative in their self-efficacy beliefs and demonstrated less generality of self-efficacy beliefs than their regular-class peers.

In summary, research on self-efficacy in academic settings lends support to the use of self-efficacy as a criterion variable in this study. As mentioned before, much of the research on self-efficacy in academic settings is task-specific in particular domains. One particular domain of interest to this study is mathematics.

Self-Efficacy and Mathematics

The bulk of the research investigating the connection between self-efficacy and academic achievement is in the area of mathematics. A precursory understanding of the literature on this topic outlines the framework for establishing similar connections between self-efficacy and the subject of English. Additionally, some of the findings regarding self-efficacy in the mathematics domain may have implications for other domains, as well.

Bandura and Schunk (1981) explored self-efficacy and goal-setting with children. They found that providing children with a proximal goal, increased motivation, self-efficacy, and skill acquisition. Schunk (1981) assessed children's skill, persistence, and self-efficacy for solving different types of division problems before and after watching adult modeling or didactic instruction. He determined that self-efficacy related positively to persistence and achievement for children receiving both types of instruction.

In a study involving children receiving long-division instruction, Schunk (1984b) showed that giving children specific performance goals enhanced self-efficacy. Moreover, more difficult goals increased self-efficacy, and when combined with persuasory (see Glossary) information (e.g., statement of belief in student's capabilities), led to the highest math skill level.

When students set their own goals, self-efficacy is promoted (Schunk, 1985). Schunk studied sixth graders with learning disabilities who were receiving subtraction instruction. Self-set performance goals led to the highest self-efficacy and skill in this area (Schunk, 1991).

Schunk and Hanson (1989a) conducted a similar study of low-achieving children who were attempting to learn subtraction operations. After having the children observe videotapes of different models (i.e., peer mastery model, peer coping model, adult/teacher model) explaining and demonstrating math subtraction operations, peer modeling was determined to increase self-efficacy for learning and skill better than teacher models or no models.

Schunk and Gunn (1985) also showed that modeled strategies enhance self-efficacy and motivation during mathematics instruction. Similarly, Schunk and Cox (1986) found that acquisition and application of a strategy raised motivation, self-efficacy, and skill in subtraction and regrouping operations in mathematics.

Students who were below grade level in math and fraction skills were videotaped in a study by Schunk and Hanson (1989b). Some students were shown videotapes of themselves successfully solving problems; these were the "self-modeling" group. Other students were taped and not shown their tapes until after the study. Another group of children were not taped at all. The self-modeling group of children scored higher on self-efficacy for learning, motivation, and posttest self-efficacy and skill than did children in the other two conditions.

Lopez and Lent (1992) investigated sources of mathematics self-efficacy in high school students. They determined that grades in perceived performance accomplishments accounted for substantial amounts of variance in self-efficacy. This would seem to support the idea that previous performance is the most influential source of math self-efficacy for high school students, and perhaps reflective of self-modeling effects.

Pajares and Miller (1994) used path analysis to test the predictive and mediational role of self-efficacy beliefs in mathematical problem solving. They reported that math self-efficacy had stronger direct effects on mathematics problem solving than did self-concept, perceived usefulness, or prior experience. In 1995, Pajares and Miller explored three types of mathematics self-efficacy judgments: (a) confidence to solve mathematics problems, (b) confidence to succeed in math-related courses, and (c) confidence to perform math-related tasks. For the 391 students in the study, confidence to solve mathematics problems was reported as the most powerful predictor of math performance.

Other studies have shown similar support for the construct self-efficacy and social cognitive learning theory. In a study of middle school gifted students, Pajares (1996a) again used path analysis to explore the predictive and mediational role of self-efficacy beliefs in mathematical problem solving. Gifted students reported higher self-efficacy and self-efficacy for self-regulated learning than did other students. Pajares (1996a) noted that "in essence, the mathematics self-efficacy beliefs of gifted students performed the predictive and mediational roles hypothesized by social cognitive theory" (p. 338).

In 1999, Pajares and Graham conducted a study to determine whether students' mathematics self-efficacy beliefs make an independent contribution to the predictions of mathematics performance when other motivation variables shown to predict math-related outcomes are controlled. The researchers assessed 273 sixth graders, both at the beginning and end of the academic school year, across the following variables: mathematics self-efficacy, mathematics anxiety, and mathematics self-concept. They determined that self-efficacy made a modest but independent contribution to the prediction of mathematics performance. Mathematics self-efficacy was the only motivation variable to predict mathematics performance both at the beginning and end of the school year. Clearly, there is strong evidence for a relationship between self-efficacy and mathematics achievement; research also suggests the same relationship exists between self-efficacy and English achievement.

Self-Efficacy and English

As with mathematics performance, there has been extensive research on the relationship of self-efficacy and English performance. The two topics most examined have been the relation of self-efficacy to the sub-skills of reading and writing. Five major studies have explored the relationship between self-efficacy and reading–writing achievement: (a) Pajares and Johnson (1994), (b) Pajares and Johnson (1996), (c) Schunk and Swartz (1993), (d) Shell et al. (1989), (e) Zimmerman and Bandura (1994).

Shell et al. (1989) examined the relationship between self-efficacy and outcome expectancy beliefs and achievement in reading and writing in a study with 153 college students. Their results indicated that self-efficacy and outcome expectancy beliefs are significantly related to performance for both reading and writing. Self-efficacy beliefs were more strongly related to achievement than outcome expectancies for both reading and writing.

Schunk and Swartz (1993) addressed how goal setting and progress feedback affect self-efficacy and writing achievement in two experiments with elementary school children. In one experiment, 60 fifth graders were given a pretest on self-efficacy, and randomly assigned to one of

the following four different treatment groups: (a) product goal, (b) process goal, (c) process goal plus progress feedback, or (d) control group. Following treatment, each group was administered a posttest to measure self-efficacy and achievement outcomes. The study results showed that children who received process goals and progress feedback outperformed other students. In a second experiment replicating the previous experiment, fourth grade students were placed in the same treatment groups, and groups were assessed for academic strategy use following treatment. Schunk and Swartz (1993) concluded that "as predicted, we also found that combining process goals with progress feedback enhanced transfer of writing strategy use, skill and self-efficacy" (p. 351). For both experiments, self-efficacy was highly predictive of writing skill.

Pajares and Johnson (1994) explored the role of self-efficacy, outcome expectancy, and apprehension in 30 undergraduate preservice teachers in a language arts class. The researchers used the same measure for writing self-efficacy as used by Shell et al. (1989). Writing self-efficacy was the only variable among the three that was significantly related to writing performance both at the beginning and end of the course.

In a path analysis study, Zimmerman and Bandura (1994) found that self-efficacy for writing beliefs significantly predicted college students' personal standards for the quality of writing considered self-satisfying. Self-efficacy for writing also was found to significantly predict student goal setting and writing proficiency. Pajares and Johnson (1996) conducted a path analysis to test the influence of writing self-efficacy beliefs, writing apprehension, and writing aptitude on the writing performance of entering high school students. The self-efficacy of 181 ninth graders in a public high school was hypothesized to play a predictive and mediational role in the prediction of writing performance. "Our results indicate that students' self-efficacy perceptions are strong predictors of their writing performance and play the mediational role that social cognitive theory hypothesizes" (Pajares & Johnson, 1996, p. 169).

The research investigating the relationship of self-efficacy and English is hindered by some limitations. Evaluating writing usually involves subjective measures, making the use of writing achievement as an outcome variable problematic for assessing writing achievement. Additionally, as with writing, most measures of reading achievement are not criterion-referenced, which inhibits the examination of their relationship to self-efficacy due to its domain specific nature. Despite these research challenges, there seems to be substantial support for the use of self-efficacy as an outcome variable in this study. In summary, the importance of career development as an integral part of academic planning, the emerging labor market trends, the need for fiscal responsibility in education, the lack of improvement in reading and math achievement of students, and the relationship of self-efficacy and motivation to academic achievement all support the investigation of English self-efficacy as an outcome variable in this study.

Motivation

Uguroglu and Walberg (1979) synthesized research on motivation and academic achievement from a calibration sample of studies from 1974 to 1976. They reported that "for grades 1–12, 232 uncorrected observed correlations showed a mean of .338, indicating 11.4 percent of the variance accounted for in achievement by motivation" (p. 375).

Covington (2000) discussed the evolution of the achievement motivation construct. Covington posited that the motivation construct evolved from being conceptualized as "drives" to an alternative view of motives as goals that influence the quality and intensity of behavior. Achievement goal theory hypothesizes that "learning goals favor deep-level, strategic-processing of information, which in turn leads to increased school achievement" (p. 175). Covington maintains that the available evidence supports this hypothesis.

Another long-standing conceptualization of motivation is Expectancy-value theory. The Expectancy-value theory of motivation was selected for use in this research project due to its consistent nature with the construct self-efficacy and the supporting research for the theory. As explained in the previous Literature Review section, Expectancy-value theory maintains that an "individual's choice, persistence, and performance can be explained by their beliefs about how well they will do on the activity and the extent to which they value the activity" (Wigfield & Eccles, 2000, p. 68).

A strong body of research supports the expectancy-value model of motivation. Eccles and her colleagues (see Eccles & Wigfield, 2002) have conducted three major longitudinal studies investigating how children's expectancies for success, ability beliefs, and task values change across school years, and how children's beliefs and values relate to their performance and activity choice.

The first longitudinal study explored gender differences in achievement beliefs and values about mathematics and English. A cross-section of fifth graders through twelfth graders completed questionnaires over a 2-year period. The questionnaires measured the students' achievement beliefs and values regarding the tasks in school. A second longitudinal study looked at how the transition from elementary to junior high school influenced children's beliefs and values regarding different academic subjects, sports, as well as social activities. Following sixth grade children into seventh grade, children's ratings of the importance of both math and English decreased. Similarly, their appreciation for both subjects decreased, as well.

In a third longitudinal study, Eccles and Wigfield followed a group of students in the first, second, and fourth grades through high school graduation to see how children's achievement beliefs and values change through the elementary and secondary school years (Eccles & Wigfield, 2002). The 10-year project yielded several interesting findings. In cross-sectional analyses of the study, researchers found linear decreases in children's ability related to beliefs across the elementary school years—especially in the academic achievement domains. These declines continue across the high school years. Continued analysis of the data (Eccles & Wigfield, 2002) showed that older elementary children valued math and reading less than younger children. In contrast, children's value of sports activities was higher in older children than in younger children.

One of the most significant findings from the three longitudinal studies is in regard to ability-related beliefs and subjective task values predicting performance and choice. Children's subjective task values were the strongest predictors of their intentions to keep taking math. There is similar evidence for the effect of ability-related beliefs and expectancy for success on academic achievement; "even when previous performance is controlled, children's beliefs about their ability and expectancies for success are the strongest predictors of subsequent grades in math, predicting those outcomes more strongly than either previous grades or achievement values" (Wigfield & Eccles, 2000, p. 77).

Research Literature on the Background Variables

It is important to control for several background variables in order to determine the independent contribution of the predictor variables to the association with academic self-efficacy and academic motivation. Background variables included in this study are: student prior achievement, parent educational level, student race, and student gender. Mok and Flynn (1997) found student gender and parent educational level to be better predictors of quality of school life than school size. This underscores the influence of student gender, parent educational level, and student socioeconomic status as background variables.

As well, there is research to support the inclusion of student race as a student level variable (McWhirter, Bandalos, & Hackett, 1998) included in this study. Both student race/ethnicity and student gender have been determined to influence academic outcomes.

Recent research shows a relationship between student socioeconomic level and academic outcomes (Jimerson & Egeland, 1999; Seccombe, 2000; Sutton & Soderstrom, 1999). Research indicates that "overall, poor children receive lower grades, receive lower scores on standardized tests, are less likely to finish high school, and are less likely to attend or graduate from college than are non-poor" (Seccombe, 2000, p. 1108). Awareness of the relationship among student SES, predictor variables, and the outcome variables of English self-efficacy and motivation also has importance for school district administrators. Some researchers maintain that "at the local level, school district policy makers need to recognize that socioeconomic level, as often defined by students eligible for free or reduced-price lunch, places those students at risk for poor performance, failure, suspension, or dropping out of school" (Sutton & Soderstrom, 1999, p. 336). Therefore, student socioeconomic status was included as a background variable to be controlled, in order to determine the independent contribution of the predictor variables.

Conclusion

While there is strong research in the area of academic self-efficacy and academic motivation, there are formidable gaps in the research investigating career interventions. The career intervention studies have been singular and isolated, often without consideration or measure of students' level of career development. The lack of studies on specific career interventions and career development activities is a hindrance to designing and implementing effective comprehensive guidance programs.

Moreover, the relationship between career development and academic achievement is ambiguous, unclear, and vastly underinvestigated. More research in this area is clearly needed. Equally disturbing are the contradictory findings regarding student outcomes such as career maturity and academic achievement. This incongruity points to a need for greater replication of previous studies and continued reevaluation and operationalization of constructs within the field of research in career development. Researchers need to continue to weave the nomological net around career development and career development interventions. Specifically, the direct and indirect variance in academic achievement driven by specific career development interventions.

Career development interventions have the potential to help guide students as well as increase student motivation and self-efficacy. Little is known about the relationship of career development interventions to motivation and self-efficacy. Hence, understanding of the influence career development interventions have on student motivation and self-efficacy would greatly advance the state of knowledge and practice in the area.

METHOD

This section will explain the methods used for data collection in this study. The participants will be described, followed by the procedures for selecting schools. Then, the measures used in the study will be detailed. Finally, data analysis will be discussed.

Participants

High school seniors aged 18 and over were selected as the sample population. This sample was selected for two reasons. First, as legal adults, the students are able to give informed consent without parental permission. This sample of participants was preferred to using minors who require parental permission to participate in the study for several reasons. Since parents of low socioeconomic status are less likely to return permission slips, the use of minors would result in a skewed sample. Similarly, parents who are suspicious of education, parents who are antagonistic toward schools, or parents from certain political/cultural backgrounds may be unwilling to allow their children to participate in the study (Beauvais, 1999).

Second, as seniors, these students were in a position to reflect on 4 years of high school experiences in responding to survey data. Younger students in lower grades have fewer experiences to reflect on, and may not have had the opportunity to experience those interventions that tend to occur in the upper grades.

The study had a total of 293 student respondents—49% were female and 51% male. The self-identified race/ethnicity demographics were as follows: 75.4% White/European, 3.4% Asian/Asian American, 6.5% Black/African American, 0.3% Middle Eastern/Middle Eastern American, 7.8% Hispanic/Latino American, 1.4% Pacific Islander, 1.7% American Indian/Alaskan Native, 1.4% Other, and 2% Declined to Respond. The participants were primarily 18 years old (95%). Overall, only 11% of the students were on free/reduced lunch.

Procedures

Procedures for the selection of schools used in the sample, as well as for the selection of the individual participants, are presented. A standardized protocol detailed the selection of individual participants, the collection of archival data, and the administration of surveys.

School Selection

The participants came from four regions of the country: Northwest, Southwest, Midwest, and East Coast. In total, 20 high schools were selected. In each region, high schools were selected based on the school's willingness to participate in the study. Specifically, in each region, a researcher contacted an administrator at the district level and solicited interest in the research project. The district administrator then recruited high schools and school counselors within the district to participate in the research study.

Northwest Region

The five high schools from this region were selected from a large metropolitan area in the eastern part of Washington State. The enrollment size of the participating high schools ranged from 296 to 1,845 (M = 1,394). Across the five schools, the average percentage of students participating in the free/reduced lunch program was 30%. The average drop-rate for these schools was 14%.

Southwest Region

The five high schools from this region were selected from one of the largest school districts in the nation. The enrollment size of the participating high schools ranged from 1,972 to 3,644 (M = 2,471). Across the five schools, the average percentage of students participating in the free/reduced lunch program was 33%. The average drop-rate for these schools was 5%.

Midwest Region

The six high schools from this region were selected from two school districts in the suburbs of a major metropolitan area. The enrollment size of the participating high schools ranged from 1,412 to 2,647 (M = 2,255). Across the five schools, the average percentage of students participating in the free/reduced lunch program was 3%. The average drop-rate for these schools was 2%.

Eastern Region

The three high schools from this region were selected from a large metropolitan area of a Mid-Atlantic state. The enrollment size of the participating high schools ranged from 1,221 to 1,727 (M = 1,443). Across the five schools, the average percentage of students participating in the free/reduced lunch program was 11%. The average drop-rate for these schools was 4%.

Measures

Senior Survey

A survey instrument was designed to measure the 44 career interventions and four career development taxa. Each career intervention was described in behavioral terms, to prevent confusion with technical terms or career development jargon. A national panel of career development experts critiqued the survey instrument, and recommendations for improvements were incorporated into subsequent drafts of the survey. In addition to respondent information on the career development interventions, the survey also collected information on student age, student race/ethnicity, student gender, and parent educational level. A copy of the Senior Survey can be found in Appendix E.

On the Senior Survey, participants were supplied with two different metrics for use in responding to the survey questions about the quantity received for each of the 44 career development interventions. For items that occur episodically during a school year (e.g., job shadowing), the participants were simply asked to report how many times they experienced the intervention during each year of high school. The total for each of all 4 years of high school was computed and entered into the database.

Some participants entered unquantifiable responses such as “a lot,” “infinity,” or “hundreds.” These responses were temporarily coded as “missing data” when entered into the database and excluded from the frequencies run for the data. The responses were then replaced with the top of the range for that item, as listed in the frequency count.

For items that occur on a semester basis (e.g., youth internships), the participants were asked, for each year of high school, to circle “1st” if they experienced the intervention during the first semester and circle “2nd” if they experienced the intervention during the second semester. For the purpose of data analysis in this research project, the total number of semesters circled for each year of high school was computed and entered into the database.

Student Opinion Survey (SOS)

Self-efficacy and motivation were measured using the Student Opinion Survey (SOS), an assessment developed by McMillan, Simonetta, and Singh (1994). The 37-item instrument was based on the expectancy-value model of motivation. It was developed to measure both self-efficacy and attitudes of elementary, middle, and secondary students toward the importance of learning in

general and the academic content areas of science, mathematics, and English. McMillan, Simonetta and Singh (1994) used Eccles and Wigfield's (2002) expectancy-value model of motivation and Bandura's (1977) definition of the construct self-efficacy as the theoretical underpinnings in designing the instrument. The English self-efficacy and English motivation items in the instrument are designed to assess the degree to which students value the task of English and believe that they are capable of being successful in English. The mathematics self-efficacy and mathematics motivation items in the instrument are designed to assess the degree to which students value the task of mathematics and believe that they are capable of being successful in mathematics.

The English self-efficacy subscale, English motivation subscale, mathematics self-efficacy subscale, and mathematics motivation subscale were used in this study. The English self-efficacy subscale has a reliability coefficient of .82 for the high school form. The English motivation subscale has a reliability coefficient of .77 for the high school form. The alpha coefficient for the English self-efficacy subscale is .68 (N = 293) in the present study. The alpha coefficient is .72 (N = 293) for the English motivation items.

The mathematics self-efficacy subscale has a reliability coefficient of .82 for the high school form. The mathematics motivation subscale has a reliability coefficient of .77 for the high school form. The alpha coefficient for the mathematics self-efficacy subscale is .89 (N = 293) in the present study. The alpha coefficient is .74 (N = 293) for the mathematics motivation items.

Description of Background Variables

Gender

Gender was determined by respondents' choice between the categories male or female on the survey instrument.

Race/Ethnicity

Student race/ethnicity was determined by student selection from the category choices of Black/African-American/Non-Hispanic, Asian or Asian American, Pacific Islander, American Indian or Alaskan Native, Hispanic or Latino American, White/European American/Non-Hispanic, Other, or Decline to Respond. These categories were then collapsed into two categories (i.e., White, Student of Color) for the regression analyses.

Socioeconomic Status

Parent educational level was used as a proxy for socioeconomic status. The use of parent education level as a proxy for socioeconomic status is a common practice in research (Demissie, Hanley, Menzies, Joseph, & Ernst, 2000). Respondents were asked to select one of the categories as the highest degree for the adult with whom the student has spent the most time during high school. Since high school students often experience a variety of living situations throughout their high school experience, the operational definition of "adult with whom you have spent the most time" was used rather than the term "parent." Respondents were asked to select one of five categories: (a) none, (b) High School Diploma or GED, (c) Community College (AA, AS, AAS, etc.), (d) 4-year College (BA, BS, etc.), or (e) Master's Degree or Doctorate (MA, MS, PhD, etc.). These categories were then collapsed into a bivariate categorization (i.e., None or High School Diploma/GED; or Community College or above) to simplify the regression analyses.

Prior Achievement

Prior achievement was operationalized as student scores on standardized achievement tests from the seventh, eighth, or ninth grade. The school counselors gathered the students' achievement scores from student files. Achievement scores were entered into the statistics database as national curve equivalent (NCE) percentages. To obtain a prior English achievement score, the NCE scores

were taken from the Reading Total section of the achievement exams. To obtain a prior mathematics achievement score, the NCE scores were taken from the mathematics total section of the achievement exams. The prior achievement scores for the students in this study can be found in Table 2.

Data Analysis

Overview

Stepwise multiple regression was used as a statistical procedure to analyze the data and test the null hypotheses. Each of the career development taxa was entered as a predictor variable and regressed against the academic self-efficacy criterion variables (i.e., English self-efficacy and mathematics self-efficacy) to determine the independent contributions beyond the effects of the background variables. The process was repeated, regressing the career development taxa on the other criterion variable domain—academic motivation. Thus, statistical analyses will be used to determine both information on all the predictors as a group (R^2) as well as the contributions of individual predictors by examining their bivariate correlations (R). Stepwise, multiple regression affords the study useful options in exploration of the data.

The statistics program SPSS was used for all regression analyses. Using SPSS, predictor variables must be entered together as a block or separately, each within their own block. When items are entered together as a block, SPSS holds each predictor constant against the others. When each predictor is entered as a separate block, the order of the variables influences their explanatory power within the regression. Therefore, it is necessary to have a rationale for the order when opting to enter predictor variables as separate blocks within the regression analyses. The more conservative form of multiple regression analyses is to enter predictor variables that are oriented together as a block, allowing the computer to determine order of entry into the regression. However, in this process, SPSS will give order priority to the variables with the largest R^2, or largest proportion of explained variance.

In this study, no predetermined rationale exists to help determine the order of entry for the predictor variables. Therefore, in reference to the research questions, the most conservative ordering was employed. Specifically, the background variables were all entered as one block, and the career development intervention taxa were entered as a second block for the regressions on English Self-Efficacy, English Motivation, Mathematics Self-Efficacy, and Mathematics Motivation.

Calculating Total Score for Career Development Taxa

As noted earlier, the career development interventions included in the Senior Survey were measured using one of two metrics (i.e., episodic, academic term). Since these interventions are measured on different scores, it was necessary to convert the variable values to some type of standard score for the purpose of data analyses (Hays, 1994).

The determination of a standard score for each taxon was done by completing the following steps:

Step 1. The total of episodic intervention events that occurred in each taxon was calculated, and that sum was divided by the total number of episodic interventions.

Step 2. The total of term intervention events that occurred in each taxon was calculated, and that sum was divided by the total number of term interventions.

Step 3. The variance of episodic intervention was determined.

Step 4. The variance of term intervention was determined.

Step 5. The episodic and term intervention averages were combined by taking into account the inverse of the variances of all scores.

The exact algorithm for the calculation completed in Step 5 can be found in Appendix F.

Missing Values

Missing values were handled using the expectation maximization (EM) procedure in SPSS. This procedure was selected because the missing values were primarily random in nature, rather than occurring in a systematic fashion. EM is "the recommended approach for dealing with most data problems. It has the advantages of the SPSS implementation of the regression approach, plus it uses additional information through the iteration process" (Acock, 1997, p. 94). Using an algorithm to estimate the means, the covariances and Pearson correlations of quantitative variables, EM computes expected values on the observed data and estimates of the parameters, and then calculates maximum likelihood estimates of the parameters based on the expected values.

Regression Procedures

Stepwise multiple regression was used to investigate the relationship of the predictor variables to each of the four criterion variables (i.e., English self-efficacy, English motivation, mathematic self-efficacy, mathematics motivation). Thus, there were four stepwise regression analyses. In each analysis, the background variables were entered as a block, and then the career development interventions were entered as a block. For each block, a stepping method using the probability of F was employed, with an entry criterion of $p < .05$ and an exiting criterion of $p < .10$. In block 1, the following variables were entered as predictor variables: prior English achievement, student gender, student race/ethnicity, and parent educational level. One of the four criterion variables was entered as the criterion variable. In block 2, the predictor variables Field, Advising, Introductory, and Curriculum were entered in block 2. One of the four criterion variables remained as the criterion variable.

RESULTS

The specific contribution of background variables and four career development taxa to the academic self-efficacy and academic motivation of 293 high school seniors were examined through stepwise multiple regression. Each predictor set included (a) four background variables (Gender, Race/Ethnicity, Prior Achievement, and Parent Educational Level) and (b) four career development intervention taxon variables (Field, Advising, Introductory, and Curriculum). The four criterion variables examined were English self-efficacy, English motivation, mathematics self-efficacy, and mathematics motivation.

Individual Intervention Level

Episodic

Table 3 shows the descriptive statistics for the career development interventions measured using the episodic metric. In total, there were 33 career development interventions measured using this metric. Please note that due to limited space, the word counseling is abbreviated "Coun" in all tables.

As indicated by the data in Table 3, the interventions "Career Information Infused into the Classroom" and "Career Skills Infused into the Classroom" had the highest participation averages, according to respondents. The intervention "Referral to External Counseling/Assessment" had the lowest participation average per respondent.

Academic Term

Table 4 shows the descriptive statistics for the career development interventions measured using the academic term metric. Given the fact that the time period assessed was the whole of high school, the range of the academic term metric was 0 to 8 semesters. In total, there were 11 career development interventions measured using this metric.

Respondent data indicated that enrollment in a "Career/Technical Education Course" had the highest participation average. This average indicated that respondents took an average of one semester of career/technical classes during their 4 years of high school. The "Tech Prep/2+2 Curriculum" career development intervention had the lowest participation average per respondent.

Taxon Level

Episodic

Table 5 shows the descriptive statistics for the career development intervention taxa, measured using the episodic metric. As the Table shows, the Curriculum taxon had the largest average in the episodic metric. The Field, Advising, and Introductory taxa had much similar averages.

Academic Term

Table 6 shows the descriptive statistics for the career development intervention taxa, measured using the academic term metric. The Introductory taxon is missing from this Table, for none of the interventions in this taxon were assessed using an academic term metric. The Advising taxon had the highest average. The Field taxon average was measured using the academic term metric.

Criterion Variables: Descriptive Statistics

The descriptive statistics for the criterion variables English self-efficacy, English motivation, mathematics self-efficacy, and mathematics motivation are displayed in Table 7.

Regression Analyses

Regression Analysis 1: English Self-Efficacy

A correlation matrix for the variables in this regression analysis can be found in Appendix G. The criterion variable for this analysis was English self-efficacy. The analysis yielded two significant predictor variables. These variables were English Prior Achievement and Race/Ethnicity (i.e., 0 = White, European American, Non-Hispanic; 1 = Student of Color). Examination of the correlation matrix reveals that English self-efficacy was positively related to student of color status. In terms of the regression study, English Prior Achievement combined with Race/Ethnicity to predict 4% of the variance of English self-efficacy. The statistics associated with this regression analysis can be found in Table 8.

Regression Analysis 2: English Motivation

A correlation matrix for the variables in this regression analysis can be found in Appendix H. The criterion variable for this analysis was English motivation. The analysis yielded one significant predictor variable. This variable was Gender (i.e., 0 = Female, 1 = Male). Examination of the correlation matrix reveals that English motivation was positively related to females. In terms of the regression study, Gender predicted 7% of the variance of English motivation. The statistics associated with this regression analysis can be found in Table 9.

Regression Analysis 3: Mathematics Self-Efficacy

A correlation matrix for the variables in this regression analysis can be found in Appendix I. The criterion variable for this analysis was mathematics self-efficacy. The analysis yielded two significant predictor variables. These variables were Math Prior Achievement and Gender (i.e., 0 = Female, 1 = Male). Examination of the correlation matrix reveals that Mathematics self-efficacy was positively related to females. In terms of the regression study, Mathematics prior achievement combined with Gender to predict 17% of the variance of Mathematics self-efficacy. The statistics associated with this regression analysis can be found in Table 10.

Regression Analysis 4: Mathematics Motivation

A correlation matrix for the variables in this regression analysis can be found in Appendix J. The criterion variable for this analysis was mathematics motivation. The analysis yielded one significant predictor variable. This variable was the Advising taxon. Thus, the Advising taxon predicted 4% of the variance of Mathematics motivation. The statistics associated with this regression analysis can be found in Table 11.

Supplemental Analyses on Participation Rates

In order to understand how the career development intervention participation patterns of the subjects of this study differed from broad national surveys, a series of binomial tests were conducted. These binomial tests involved the participation rates of the 7 interventions reported by Delci and Stern (1999). In addition, Delci and Stern's overall career program (i.e., the seven interventions combined) participation rate was examined against the rate reported by the subjects of this study on the same seven interventions combined. Finally, the CTE course participation rate of the subjects of this study was compared to the national results reported by Levesque et al. (2000). The results of these tests can be found in Table 12.

Overall, the participation rates were significantly higher for the subjects of this study compared to the results reported by Delci and Stern (1999). However, the CTE course enrollment was significantly lower than the national figures reported by Levesque et al. (2000).

DISCUSSION

This exploratory study investigated the relationship of career development intervention taxa to academic self-efficacy and to academic motivation of high school students. Self-respondent and archival data were collected from 20 different high schools in four regions of the United States. A total of 293 high school seniors completed a measure assessing English self-efficacy, English motivation, mathematics self-efficacy, and mathematics motivation. In addition, these students completed an instrument that measured the quantity of career development interventions experienced across high school. Stepwise multiple regression analyses revealed the following modest predictive relationships: (a) prior achievement and race/ethnicity to English self-efficacy, (b) gender to English motivation, (c) mathematics prior achievement and gender to math self-efficacy, and (d) Advising career development intervention taxon to mathematics motivation.

In this section, the reader will find an analysis concerning the possible reasons for significant and non-significant predictors in each of the four regression analyses. Then, the research project's limitations and implications will be discussed.

Significant Predictors

Academic Self-Efficacy

Stepwise multiple regression revealed prior achievement to be a modest predictor of both English self-efficacy and math self-efficacy. The finding of prior achievement as a significant predictor variable is consistent with other research concerning the link between self-efficacy and academic achievement (Eccles, 1983; Multon et al., 1991; Pajares & Johnson, 1996; Schunk, 1982, 1984a, 1984b, 1989, 1991, 1994, 1995; Schunk & Cox, 1986; Schunk & Gunn, 1985; Schunk & Hanson, 1989a, 1989b; Wigfield & Eccles, 1992, 1994, 2000; Wigfield et al., 1997). For instance, Multon et al. (1991) stated unequivocally, "as predicted by Bandura (1986), self-efficacy beliefs were more strongly related to achievement than outcome expectancy for both reading and writing" (p. 36). The finding of race/ethnicity as a slight predictor of English self-efficacy was also consistent with the literature (Mayo & Christenfeld, 1999; McWhirter et al., 1998).

Academic Motivation

Stepwise multiple regression retained gender as a significant predictor of English motivation. This finding was consistent with the literature (McWhirter et al., 1998; Mok & Flynn, 1997). In terms of mathematics motivation, stepwise multiple regression retained the Advising taxon as significant predictor. It makes logical sense that many of the interventions in the Advising taxon increase mathematics motivation. Unlike English skills, the practical utility of mathematics is not transparent. Thus, interventions in the Advising taxon such as "Academic Planning Counseling" could potentially help students see the connection between their academic tasks in math classes and their vocational goals. Seeing the connection between their current mathematics schoolwork and their vocational goals increases students' valuing of the subject mathematics and their subsequent scores on the mathematics motivation subscale of the SOS. Of course, further research is necessary to examine which specific interventions actually leverage mathematics motivation.

While the results regarding the Advising taxon were statistically significant, the clinical significance of these findings was negligible (see Thompson, 2002, for a thorough discussion of the difference between statistical and clinical significance in counseling research). Still, these modest findings with regard to the Advising taxon should prompt reflection among CTE professionals. Interventions in the Advising taxon are sometimes overlooked. Interventions such as "Career Day/Career Fair" (in the Introductory taxon) are certainly of much higher profile, and receive greater notice from educational administration and the community. In contrast, interventions such as "Academic Planning Counseling" are not given as much acclaim or praise. Much

emphasis has been placed on work-based learning activities found in the Field taxon. These interventions often receive special emphasis among career development interventions and special funding as well, as outlined in the School-to-Work Opportunities Act (1994). Burtnett (1993) supports this point by stating that K–12 counseling programs (often comprised of many of the Advising taxon interventions) have been "conspicuously missing from the education reform initiatives" (p. 51). Interventions in the Advising taxon are often taken for granted—it is just assumed that they are actually occurring within the school setting. These findings might suggest a renewed emphasis on interventions within the Advising taxon.

Non-Significant Predictors

The four regression analyses presented several non-significant predictors. For example, in the stepwise multiple regression on the criterion variable English self-efficacy, none of the career development taxa and only 2 background variables were determined to be statistically significant predictors of English self-efficacy. There are several plausible explanations for the overall lack of significant findings across the four regression analyses. The explanations include: (a) the targeting of low-achieving students for career development interventions, (b) the low quantity of career development interventions, and (c) the lack of relationship between career development interventions and English self-efficacy.

Targeted Students

A plausible explanation for the lack of significant predictors also involves the Field taxon. As discussed in the Literature Review section, the research evidence indicates that the experience based career education (EBCE) model is related to positive student outcomes. The interventions that make up the Field taxon are largely drawn from the EBCE model. Using the knowledge of EBCE, educators may be employing Field interventions with select groups of students in an attempt to improve specific student outcomes such as attendance and attrition. The correlation between Field and prior English achievement (i.e., $R = -.25$) hints that low-achieving students are being targeted disproportionably for Field interventions. This process, in turn, could contribute to the lack of significant predictors identified in the stepwise multiple regression analyses.

Lack of Quantity (Dosage)

On average, only a small quantity of the career development interventions were delivered to the students who participated in this study. It is possible that a threshold effect exists, and that students may not be getting a sufficient dosage of career development interventions in order to register a positive impact on academic outcomes. Drawing on an analogy in medicine, a study that investigated only low doses of antibiotics might erroneously determine that the antibiotics have no positive impact on fighting infection. Similarly, the respondents in this study may have experienced such a low quantity of career development interventions, they are simply not getting enough of the intervention to discern positive effects.

Research certainly seems to support this argument. As discussed in the literature review, Oliver and Spokane (1988) found that increasing a career counseling session from 6 to 7 increased the average effect size by 2.3 times, from $ES = 1.19$ to $ES = 2.73$, respectively. Such drastic increases were not always the case, though, as the effect size decreased from $ES = .85$ to $ES = .74$ when going from 2 to 3 sessions. Whiston et al. (1998) provide similar support in their replication study, which indicated that the mean effect size for number of career counseling sessions went from $ES = .08$ at 5 sessions to $ES = .99$ at 5.5 sessions. The lack of significant findings may be due in part, or in whole, to the lack of a substantial quantity of career development interventions. Two research studies on specific interventions and dosage-effects have appeared in the literature. Myers et al. (1975) found that dosage level was related to the effectiveness of a computer-based career

guidance program. Kadera, et al. (1996) reported similar results with their study of dosage-effect in psychotherapy.

No Relationship

A central tenet of Bandura's theory of self-efficacy is that self-efficacy is domain-specific (Bandura, 1997). Therefore, the non-significant findings reported in this study may be because career development interventions, as currently designed and implemented, are too domain-disparate from English learning to impact English self-efficacy, and from math learning to impact math self-efficacy.

Limitations

Every study has limitations, and this research project is no exception. There are four primary areas of limitation for the results of this research project: (a) generalizability compromised, (b) narrow intervention measures, (c) the retrospective nature of the study, and (d) the set of respondents.

Generalizability

Several considerations limit the generalizability of the findings. The use of regions and selection process for schools compromise the generalizability of the findings. The regions for this study were the Midwest, Southwest, Northwest, and East Coast. Moreover, district and school selection was done with a convenience sampling procedure, rather than a random sampling procedure. The strength of random sampling increasing generalizability lies in the concept that the procedure allows each study participant an equal chance of being selected (Agresti & Finlay, 1997; Rubin & Babbie, 1997). While respondents within the schools were selected using a random sampling procedure, the schools were selected based on the willingness of counselors to participate. The sampling procedure for this study did not give an equal chance of selection to schools or to the respondents therein. Therefore, broader studies are needed to confirm the general applicability of the findings of this study.

Narrow Intervention Measures

There are limitations to the study measures for career development interventions. The interventions measure used in the present study simply determines the occurrences of the interventions. This is a narrow metric in two ways. First, the unit measured is inexact. Second, there is no assessment of quality.

The inexact measurement problem is specifically the fact that the quantity of interventions is measured in occurrences, rather than in hours. This choice for quantity also limits the results of the study in that there is not a comparison of the number of hours required per intervention. For example, consider the variance inherent in the delivery of the Service Learning intervention across this nation. It is conceivable that a student may have spent 2 hours in the intervention for one school, while at a different school a student may have spent 6 hours. Although the second example was 3 times as long, for this study, both may have been counted equally.

The intervention metric employed in this study did not assess intervention quality. Specifically, this study did not measure quality in terms of (a) level of implementation (i.e., is the intervention conducted for students schoolwide, as an essential component of their educational program), (b) timing of the intervention (i.e., grade, time of academic year), or (c) delivery of the intervention (i.e., which educational personnel conducted the intervention—counselor, teacher, aide, principal, or other). These factors would logically influence the potential efficacy of career development interventions.

The quality of an intervention also refers to the inclusion of essential components of the intervention, the amount of time spent in an intervention, and educational emphasis on the intervention itself. For example, Service Learning is a career development intervention in the Field taxon. Item #58 of the Senior Survey measures this intervention by asking respondents to indicate the number of times "I worked as a volunteer and got high school credit for it." This item assesses quantity only. Some schools implement this intervention merely as requiring students to conduct volunteer hours in community service, while other schools require students to keep a reflection journal and complete class assignments that relate the students' experiences to their vocational aspirations. These are qualitatively different interventions, and the measurement of the quality component may potentially be more influential than quantity on the formation of English motivation and English self-efficacy.

Since there is not a measure of quality in this study, there is no assurance of a standardized delivery of the interventions under investigation. Hence, there is no guarantee that the interventions students are experiencing are delivered in the same fashion at the different schools in the study.

Similarly, the statistical conversion of intervention quantities to a standardized score makes strategic planning using the results difficult. The conversion of intervention quantities to a standardized score was necessary to capture quantities of interventions that occur on different metrics (i.e., episodic vs. academic term). The standardized score conversion, however, prevents the interpretation of the prediction equation as a direct increase in the number of total interventions within the Advising taxon. The increase in the prediction equation is actually an increase in the taxon score (a sum of the standardized score). While the prediction equation can be interpreted as "more is better," a limitation of the findings is that a direct connection between specifically how much more of the Advising taxon yields what amount of improvement cannot be determined, thus inhibiting specific strategic planning. Moreover, the results do not break down the individual interventions within each taxon. Therefore, the findings do not demonstrate the individual contribution that the interventions within each taxa make toward explaining English self-efficacy and English motivation. This task will be left to future researchers.

Retrospective Design

Another limitation of the study is its retrospective nature. Respondents were asked to reflect on their 4 years of high school and recall career development interventions. This may be a difficult task for adolescents, especially, and they may be unable to recall isolated activities from prior years of high school. The respondent data then, may be more a collection of those interventions that respondents recall as being most significant, rather than the representative total quantity of career development interventions.

One potential method of dealing with this limitation is to survey educational personnel regarding the interventions provided for students. Information as to what interventions are provided at each grade level could be used as a check on the reliability and validity of the student response data. For readers interested in a more in-depth review of the benefits and drawbacks of retrospective designs with research such as the present study, see Delci and Stern (1999).

Temporal Order of Variables

Our analyses were based upon a temporal ordering of career development interventions as the independent variables, and the key psychological mediators as the dependent variables. This ordering drew upon the extensive body of research that exists on academic self-efficacy and motivation (see Eccles & Wigfield, 2002). However, while our ordering was research-based, it has not been verified empirically, and one can make a logical case for an alternative ordering. Future research on this topic should include design and statistical methods appropriate to verify an accurate temporal ordering (Miller, 1998).

Set of Respondents

Finally, the respondents in the study may be a biased group. The measures were administered to high school seniors in the last few months of high school. At that point in the academic school year, some students have already dropped out since the *annual* event drop out rate is 4% (U.S. Department of Education, 2000). Also, the study only examined high school seniors in traditional United States high schools, and did not investigate any alternative schools or training programs. For these reasons, some students who might have been profoundly affected by career development interventions may have been excluded from participation in the research.

Again, there is some evidence to suggest that some of the career development interventions may have been targeted toward students with low Prior Achievement and low SES. If this is true, then this study is investigating the impact of those career development interventions on a select population, rather than examining how the interventions affect students in general.

The descriptive statistics for the English-criterion variables indicate the respondents in this study have high English self-efficacy and English motivation. These high levels of English self-efficacy and English motivation may also be a function of the selected respondent set. Again, as with the influence of attrition, as high school seniors near graduation, the respondents may become a select group of students not representative of the English self-efficacy and English motivation of students in general.

The descriptive statistics for the mathematics-criterion variables indicate that the respondents in this study have high mathematics self-efficacy and mathematics motivation. As with the English-criterion variable scores, these high levels of mathematics self-efficacy and mathematics motivation may also be a function of the selected respondent set. Again, as with the influence of attrition, as high school seniors near graduation, the respondents may become a select group of students not representative of the mathematics self-efficacy and mathematics motivation of students in general.

Finally, some comment needs to be made on why the subjects of this study reported a CTE course participation rate significantly lower than cited by Levesque et al. (2000). There are two likely reasons for this difference. First, the data from the present study may be a further indication of the impact of school reform on CTE course taking patterns (see Lynch, 2000, for an excellent discussion of this topic). Second, Levesque et al. used the U.S. Department of Education current definition of a CTE course for their study. This definition, which includes courses in education, day care, technology and communications, family and consumer sciences, and health may be a broader definition of CTE coursework than the one that operated in the minds of the high school seniors involved in this study.

Implications

Implications for Researchers

From this study, it is evident that research methodology in the area of career development interventions needs attention. Future research investigating career development interventions can improve the quality of inquiry in two ways: (1) the use of improved sampling, and (2) the use of experimental control.

Sampling

Two changes in the sampling procedure can improve the design of the present study. One, a larger sample will help to compensate for issues of multicollinearity by decreasing the standard error. Two, a stratified sample or probability proportionate to size sampling procedure would greatly enhance the representativeness of the sample and the ability to generalize study findings. Since the population is essentially a known population, this makes more representative sampling possible. As demographic information such as SES, race/ethnicity, and gender are usually available from schools/school districts, it is possible to use sampling procedures that ensure greater representativeness.

Control

Experimental control would greatly enhance future investigations. Investigating the impact of career development interventions presents unique challenges. The level of control necessary to discern connections between career development interventions and student outcomes such as motivation and self-efficacy may require longitudinal studies, experimental control groups, and/or the use of single subject design.

Levin and O'Donnell (1999) make several recommendations for improving the educational research. To improve the "credibility" of educational research by increasing experimental control, Levin and O'Donnell advocate the use of three phases for educational research. The three phases parallel the phases of medical research, in which initial clinical trials determine the best delivery methods and dosage of medication. Clinical trials determine if the drug produces a desired effect in the second phase. In the third phase, trial studies compare the effects of the new drug against the existing standard(s) by conducting carefully controlled randomized experiments. To follow these stages, Levin and O'Donnell argue that educational research needs to consist of randomized classroom trial studies. These studies should occur under carefully controlled conditions. Careful control involves the use of multiple independent classrooms (in each study and subsequent replication studies), the inclusion of alternative interventions (such as a placebo or control group), and "across-classroom randomization of interventions" (p. 199). In this way, students are randomly assigned to classrooms, and interventions are randomly assigned to classrooms in multiple instances. Levin and O'Donnell also argue in favor of safeguards such as "blind" and "double blind" studies to eliminate student, teacher, and researcher bias.

These suggestions have implications for investigating the effects of career development interventions. Perhaps rather than global attempts to discern connections between career development interventions and complex outcomes such as student learning, research in this area should follow Levin and O'Donnell's (1999) prescription for greater research "credibility." For example, the Advising taxon intervention "Career Map" could be taken through each of the subsequent phases, using the recommended careful control procedures. Early research can investigate those precise dimensions of the Career Map interventions that are most essential and determine the critical level of quantity. With the results of this research as the foundation, the Career Map can be further investigated for efficacy using additional randomized classroom trial studies. Finally, the intervention can be compared to other career development interventions and/or investigated within the context of a greater educational program.

Implications for Career Development Practitioners

There has been a long tradition of considering guidance issues in CTE research. Menefee (1942) conducted the most comprehensive, most carefully designed evaluation of vocational education (Kliebard, 1999). In his study, Menefee compared youths given vocational education under the Smith–Hughes Act with other youths, and determined that the former were not significantly better off than the latter. In light of his findings, Menefee pointed to the need for greater vocational guidance. He stated that "vocational training is less effective than might

otherwise be the case because of a lack of opportunity for individual guidance in the public schools" (p. 104).

The aim of this study was to uncover the relationship between the types of career development interventions and the prime psychological mediators of academic achievement. Such a study was important—with a national average of 513 students per school counselor (Harris-Aikens, 2001), any hints on where CTE professionals should focus their intervention efforts could conceivably lead to better efficiency and efficacy in the national CTE system. However, the low intervention dosage rates encountered in this study leaves open the question of the nature of the relationship between the types of career development interventions and the prime psychological mediators of academic achievement.

Further Research

This study generates questions of interest for further research in the following areas: (a) utilizing micro- vs. macro-level outcome studies, (b) the Advising taxon, (c) the sequencing of interventions, and (d) the interaction among the career development intervention taxa.

Micro- vs. Macro-Level Outcome Studies

The emergence of the issue of dosage suggests that career development researchers re-evaluate their long-standing preference for large, multifaceted outcome studies. Instead, we suggest that there is more real-world utility to examining the relationship of career development interventions to academic achievement at the micro level—specifically, through the following question, "For each of the 44 career development interventions, what dosage level is necessary to meaningfully impact the prime psychological mediators of academic achievement?" Given that this question implies a large number of studies, a CTE researcher may wonder where to start. The findings of this study do give a hint—namely the interventions of the Advising taxon.

Advising

One potential research question from this topic is, "What is the impact of the individual interventions within the Advising taxon on mathematics motivation?" The significant findings in regard to the Advising taxon point to further research within the taxon. A replication of this study should be conducted using the interventions within the Advising taxon, rather than the four career development intervention taxa investigated in this research project. The findings of this study and the research in the area provide a rationale for an investigation of the separate interventions within the Advising taxon. Moreover, research exploring the career development interventions within the Advising taxon can incorporate the research improvements suggested above. For example, investigating the Advising taxon interventions using an improved sampling procedure and experimental control can greatly improve the potential implications of the study findings.

Sequencing

It would also be worthwhile to investigate issues of sequencing with career development interventions. The students in this study reported that modal grade level for delivery of all 44 interventions was either 11th or 12th grade. Thus, little developmental sequencing occurs in practice.

One potential line of inquiry could focus on whether there is an optimal developmental sequencing of career development interventions. Potential sequencing research questions might be, "Does attending a Career Day/Fair prior to a Job Shadow increase the influence of the Job Shadow on student motivation and self-efficacy?" and "What grade levels are most appropriate for what interventions?"

A similar line of investigation can explore time sequencing for career development interventions relative to each other. An example research question may be, "Is it more effective to have a Career-Focused Parent/Student Conference 2 weeks after a Job Shadow, or several months later?" Perhaps a Career Interest Assessment is most effective at the beginning of 11th grade, as opposed to other school years. Clearly, there are a multitude of potential studies involving sequencing of career development interventions.

Interaction

Rather than occurring in a given order, perhaps career development interventions need to happen together. What is the interaction effect of career development interventions? Academic Planning Counseling, for example, might be most effective when combined with Internship. The opposite may be true, as well. Researchers have not investigated whether certain career development interventions may cancel out the positive impact of others.

For strategic planning purposes, the investigation of the career development taxa for interaction effects may also be useful. The presence of a large quantity of the Introductory taxon might increase the efficacy of the Field taxon, while a lack of Introductory taxon quantity might diminish the influence of the Field taxon.

CONCLUSION

This pilot study explored the relationship of career development interventions to the key psychological mediators of academic achievement—self-efficacy and motivation. Despite limitations common in pilot studies (e.g., convenience sampling, retrospective measures), we hoped that by employing clearly defined independent variables and psychologically based dependent variables, we would gain an insight about this relationship—a relationship that 30 years of career education research with ill-defined independent variables failed to produce. However, our results mirrored the findings reported in the career education literature. Thus, the exact relationship between specific career development interventions and academic achievement remains unclear.

Our use of clearly-defined independent variables did produce an unexpected finding—that the dosage of career development interventions administered across all students in the study schools was minimal. Thus, even if career development interventions leverage the key psychological mediators of academic achievement, such leveraging would be impossible to uncover with the dosage levels we encountered.

The question of the relationship of career development interventions to academic achievement is an important one, both practically and scientifically. We believe that research concerning this question would benefit from a shift in methodology. Given our experiences with this pilot study, we suggest that the large, macro-level, cross-sectional and longitudinal studies be replaced with the evidence-based research methods commonly used in medical research.

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APPENDIXES

APPENDIX A:

TAXON MEMBERSHIP

Field Interventions

Cooperative Education

Internships

Job Shadowing

Job Coaching

Job Placement

Mentorship Programs

Service Learning/Volunteer Programs

Work-Based Learning Project

Work Study

Youth Apprenticeships*

Advising Interventions

Academic Planning Counseling

Career-Focused Parent–Student Conference

Career Peer Advising/Tutoring*

Career Map

Career Maturity Assessment

Career Counseling

Career Interests Assessment

Career Library/Career Resource Center

Career Cluster/Pathway/Major

Career Passport/Skill Certificate

College Admissions Testing

Computer-Assisted Career Guidance

Cooperative/Dual Enrollment

Information Interviewing

Job Hunting Preparation

Personal/Social Counseling

Portfolio/Individual Career Plan

Recruiting

Referral to External Training Programs

Referral to External Counseling/Assessment

Introductory Interventions

Career Day/Career Fair*

Career Field Trip

Career Aptitude Assessment

Community Members Teach In Classroom

Guidance Lessons on Personal/Social Development

Guidance Lessons on Career Development

Guidance Lessons on Academic Planning

Curriculum Interventions

Career Information Infused Into Curriculum

Career/Technical Education Course

Career Skills Infused Into Curriculum

Career Academy/Career Magnet School

School-Based Enterprise

Student Clubs/Activities

Tech Prep/2+2 Curriculum*

Note. *The asterisk represents the taxon exemplar.

APPENDIX B:

GLOSSARY

The following glossary is designed to assist the reader by defining vocabulary terms used throughout this research report. The glossary can serve as reference for the definition of constructs, as well as variables, investigated in the current study.

Achievement behavior
Academic action such as choices of courses, persistence in education, quantity of effort, cognitive engagement, and actual academic performance in academic content areas such as math, English, and science.

Advising
A taxon of career development interventions. This constellation of career development interventions is comprised of activities usually conducted by counselors or guidance personnel. Examples include individual counseling, as well as individual parent–student career and educational planning conferences.

Bivariate or zero-order correlation coefficient
A coefficient (usually denoted symbolically as *r*) that indicates, on a scale from -1 to 1, the strength and direction of the relationship between two variables (Licht, 1995).

Coefficient of determination
The zero-order correlation coefficient; when squared (r^2), it indicates the proportion of variance that is shared by the two variables (Licht, 1995).

Coefficient of multiple determination
The coefficient that indicates the amount of variance in the criteria that is shared by the combination of predictors in a multiple regression/correlational analysis (Licht, 1995).

Curriculum
One of the four taxa of career development interventions. This constellation of career development interventions is comprised of activities that are usually incorporated into the educational system or offered as extracurricular endeavors. Examples include the Tech Prep and/or the 2+2 curriculum.

Domains
Subject-specific content areas of knowledge such as math, English, and writing. Current research seems to indicate that self-efficacy and motivation are domain-specific.

Dummy or effect coding
A method for including categorical variables in an multiple regression/correlational analysis whereby the variables are transformed into dichotomous variables indicating the presence or absence of a specific category (Licht, 1995).

Expectancy
A construct in motivation theory that refers to the beliefs of students about their future success in an upcoming event. This construct is, in turn, influenced by the students' task-specific self-concept and their perception of task difficulty.

Expectancy value
A model of achievement motivation. In the Wigfield and Eccles (2000) model of achievement motivation, achievement behavior is predicted by two general components: expectancy and task value.

Field
One of the four taxa of career development interventions. Activities in this constellation of career development interventions typically take place in an actual workplace context, rather than an academic setting. Examples within this taxon are job shadowing and internships.

Independent contribution
The relationship of a predictor to the criterion after the relationships of all other predictors in the study have been controlled for.

Introductory
A taxon of career development interventions. This constellation of career development interventions includes activities designed to increase student awareness of career educational opportunities. Examples include career fairs or career days.

Motivation

"The organized patterning of an individual's personal goals, emotions, and personal agency beliefs" (Ford, 1992, p. 78). Wigfield and Eccles (2000) defined achievement motivation as a function of task value and expectation of success (also see: expectancy value).

Outcome expectation
In Bandura's theory (Bandura, 1986), outcome expectations are judgments or beliefs regarding the contingency between a person's behavior and the anticipated outcome of engaging in that behavior.

Persuasory
In Bandura's theory (Bandura, 1986), an adjective for social persuasion, which is one of the sources of self-efficacy information for individuals.

Self-concept
Relating to academic performance, an academic self-concept is an integration of self-perceptions for different domains.

Self-efficacy
"People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391).

Self-esteem
A global term referring to an individual's self-perceptions of competence and the emotions associated with those self-perceptions.

Task value
In the expectancy-value theory of motivation, task value is the degree to which an individual believes a task is worthwhile or beneficial.

Taxa
The plural of taxon.

Taxon
The name applied to a group in a taxonomy.

Taxonomy
The systematic classification and naming of type groups within a subject field.

APPENDIX C:

TEXT OF RESEARCH INTRODUCTION LETTER AND INFORMED CONSENT LETTER

Research Introduction Letter:

Dear High School Senior,

On average, it takes a high school student 10 years after graduating to settle on a career! This 10-year gap presents a lot of personal and financial problems for today's young adults! I am the leader of a research team at Oregon State University and Penn State University that is trying to figure out how we can help young adults close this gap. This is where you come in. You are part of a select group of high school seniors from across the nation whom we would like to survey. As a researcher and educator, I am asking you to share (on a strictly confidential basis) some of your opinions and experiences related to your school work from ninth grade to today.

Your participation in this study is voluntary. Please read the attached Informed Consent Document. If you are willing to participate in our study, please sign the gold copy of this document and return it to the counselor from your school, which is helping us. You may keep the blue copy of this document.

If you have any questions about our research project, please feel free to contact me at (541) 737-8204. If I am not available when you call, please leave a message, and I will call back. Thank you for your time and assistance in helping our research team improve the career development activities in America's high schools.

Sincerely,

Cass Dykeman, PhD, NCC, MAC, NCSC

Informed Consent Document:

I. Title of the Research Project: The Relationship of Career Development Interventions to Positive Student Outcomes.

II. Investigator: Dr. Cass Dykeman of Oregon State University.

III. Purpose of the Research Project: The purpose of the study is to investigate the relationship between career development interventions and how well students do in school.

IV. Procedures:
I understand that as a participant in this study the following things will happen:

A. Selection:
I understand that I was randomly selected for this study by a counselor at my school. This selection was based on my being a senior in high school and 18 years of age or above. Every student in my school meeting these two criteria had an equal chance to participate in this study.

B. What Participants Will Do During the Study:
1. I will be given a survey that takes around 1 hour to complete. The survey is designed to gather my thoughts about career development interventions, career related experiences, and career perceptions in high school.

2. A guidance counselor at my school will pull from my student file data on my test scores, attendance, grades, and participation in free/reduced lunch programs.

V. Foreseeable Risk or Discomforts:
I understand that although highly unlikely, it is possible that I might find some of the questions difficult to answer. If this occurs, I could feel temporarily confused or anxious. Clearly, any such possible feelings should subside very quickly. Also, I understand that my school counselor is available, should I desire to discuss these feelings.

VI. Benefits to Be Expected from the Research:
I understand that the overall results of this research may appear in scholarly journals or be presented at research conferences. More importantly, the information that I provide may potentially assist future students and school counselors in developing more effective career interventions.

VII. Confidentiality:
I understand that a counselor from my school will have access to my completed survey, as well as my test scores, attendance records, grades, and free/reduced lunch enrollment status. I further understand that this school counselor will give all of this information to Dr. Dykeman, minus any reference to my name.

VIII. Compensation for Injury:
I understand that Oregon State University does not provide a research subject with compensation or medical treatment in the event that the subject is injured as a result of participation in the research project.

IX. Voluntary Participation Statement:
I understand that my participation in this study is completely voluntary, and that I may either refuse to participate or withdraw from the study at any time without penalty.

X. If You Have Questions:
I understand that any questions I have about the research study or specific procedures should be directed to Dr. Cass Dykeman, 541-737-8204, 100 Education Hall, Oregon State University, Corvallis, OR 97331. I also understand that if I have a question about my rights as a participant, I should contact the IRB coordinator at Oregon State University, (541) 737-3437.

My signature below indicates that I have read and that I understand the procedures described above, and give my informed and voluntary consent to participate in this study.

APPENDIX D:

PROJECT TEAM ROSTER

Senior Principal Investigator: Dr. Edwin L. Herr received his EdD in Counseling and Student Personnel Administration from Teachers College, Columbia University. Dr. Herr is Distinguished Professor of Education and Chair of the Department of Adult Education, Instructional Systems, and Workforce Education and Development at The Pennsylvania State University. Dr. Herr is the lead author of the influential text *Career Guidance and Counseling Through the Lifespan* (Herr & Cramer, 1996), and is an internationally respected scholar and leader in the areas of career counseling, counselor education, school counseling, and vocational education. Dr. Herr is a former editor of the *Journal of Counseling and Development and Counselor Education and Supervision*. Dr. Herr is also a former president of the following national professional associations: American Counseling Association, Association for Counselor Education and Supervision, and National Career Development Association.

Project Director, Principal Investigator: Dr. Cass Dykeman received his PhD in Counselor Education from the University of Virginia. He is an Associate Professor of Counselor Education at Oregon State University. Dr. Dykeman is currently the President of the Western Association for Counselor Education and Supervision. Prior to doctoral studies, Dr. Dykeman served as a school counselor in Seattle, WA. As a school counselor, Dr. Dykeman designed and implemented one of the first elementary school student assistance programs in his state. For this work, Dr. Dykeman was named "School Counselor of the Year." Dr. Dykeman served as principal investigator and project director for a Community Education Employment Center grant sponsored by the Office of Adult and Vocational Education (Grant # V199G40042).

Co-Investigator: Dr. Michael Anthony Ingram received his doctorate in Counselor Education and Supervision from the University of Cincinnati. He is an Assistant Professor of Counselor Education at Oregon State University. Dr. Ingram coordinated the Recognizing Academic Progress (RAP) program in Cincinnati, OH. The student monetary incentive program funded by Fifth/Third Bank and the Jacob & Charlotte R. Schmidlapp Foundation was designed to increase academic achievement, decrease dropout rates and provide career exploration opportunities for 1,500 middle and high school students who attended three inner-city Cincinnati Public Schools. Dr. Ingram is also recognized internationally as a performance poet and cultural storyteller.

Faculty Research Associate: Dr. Chris Wood received a Master's of Science in Psychology with a School Counseling emphasis from Eastern Washington University, and his doctorate in Counselor Education from Oregon State University. Currently, Chris Wood is an assistant professor of educational psychology at the University of Arizona. In addition, Dr. Wood was a career counselor and career assessment coordinator for a Community Education & Employment Center grant sponsored by the Office of Adult and Vocational Education (Grant # V199G40042).

Faculty Research Associate: Dr. Alix Gitelman received a BA in Computer Science from Columbia University, a MS in Mathematics from Portland State University, and a PhD. in Statistics from Carnegie Mellon University. Her current research interests include causal inference, study non-compliance, hierarchical Bayes models, environmental statistics, and educational statistics. Currently, Dr. Gitelman is an assistant professor of statistics at Oregon State University.

Research Assistant: Ms. Mandsager received her Master's of Science degree from Eastern Washington University in psychology, majoring in mental health counseling. Ms. Mandsager worked as an instructor of counseling and as a career and disabilities counselor at the University of North Carolina at Greensboro. She has most recently worked as a substance abuse counselor, clinical supervisor, and private practitioner in Winston-Salem, NC. Ms. Mandsager is currently teaching and a doctoral candidate in counselor education at Oregon State University.

Research Assistant: Ms. Meng-Yin Chen received her Master of Science degree from National Teacher's University of Taiwan. Ms. Chen has worked as both a school counselor and community college instructor. Ms. Chen is currently a doctoral student in counselor education at Oregon State University.

APPENDIX E:

SENIOR SURVEY

Part 3: Activities

Instructions: Please write down how often you participated in each activity while in high school and how helpful you found this activity in preparing you for the future.

*Example***:** Susan is a Senior in High School. As a Freshman, she went to a work site and followed a worker around watching what the worker did. Susan did this activity twice as a Sophomore. As a Junior and Senior, Susan did not do this activity. Thus, on question #22, Susan would fill in a "1" under one under 9th/Frosh and a "2" under 10th/Soph-leaving the 11th/Junior and 12th/Senior cells blank.

Survey of Activities

#	
22	I visited a work site and followed a worker around watching what he/she did
23	I went to a work site and completed a project as part of a school assignment
24	I did unpaid work at a job site to get a feel for what it was like to work in that industry
25	An adult at school helped me find a job
26	I was given a mentor who taught me about the world of work
27	An adult from school came to my job and gave me feedback on my work skills
28	A counselor helped me understand more about myself and/or my family
29	My parents, counselor, and I met at school to talk about my career choices and plans
30	I took a test that told me about how well I know myself or make decisions
31	An adult at school referred me to a counselor in the community
32	An adult at school referred me to a training program in the community
33	I took a test that told me what careers might interest me
34	I learned about further education options from a military, apprenticeship, or college recruiter
35	I took a college admissions test
36	I was taught how to find a job and get hired
37	As a school project, I interviewed someone about their job and industry
38	I talked with a peer advisor about a career question or problem that I had
39	I used a computer program and/or went on-line to learn more about careers
40	I created a portfolio of the career interests, skills, and experiences that I have had
41	I chose a career cluster, pathway, or major
42	I went to my school's library or career center to learn more about careers
43	I diagrammed and/or made a list of all of the steps necessary to reach my career goals
44	I talked with a school counselor or teacher about a career question or problem that I had
45	I talked with a school counselor or teacher about how the classes I select will fit with my goals
46	I had a lesson about how to better handle a personal or social problem
47	I had a lesson about how to select classes to take that match my goals
48	I had a lesson about planning for my future after high school

49	A person from the community came to school and, using examples from their job, taught one of my classes
50	I went to a career day/fair at my school
51	I took a test that suggests what jobs best match the skills and talents I have
52	I went on a field trip to a work site
53	In an English, math, social studies, or science class, the teacher used examples from the world of work to teach a skill
54	In an English, math, social studies, or science class, the teacher used examples from the world of work to teach us some facts

Survey of Program/Classes

#	
55	I was in a 1-year-long program where I went to school part-time and worked part-time, and got both high school credit and pay
56	I was in a 2-to-3-year-long program that combined training from both school and work
57	I received high school credit for a job I had separate from any school program
58	I worked as a volunteer and got high school credit for it
59	I earned both high school credit and college credit for a class I took
60	I participated in a program where I could earn a certificate to do a certain type of work
61	I was a member of a student club that does things that help me learn about different types of work
62	I worked in a business that operated out of my school
63	I was in a program that combined the last 2 years of high school with the 2 years of community college to prepare me for a career
64	I went to a school that organized itself around a particular career field
65	I took a voc-ed/technical-ed class

APPENDIX F:

STANDARD SCORE ALGORITHM

$$\text{Dose} = \frac{\frac{n_1 0_1}{\sigma_1^2} + \frac{n_2 0_2}{\sigma_2^2}}{\frac{n_1}{\sigma_1^2} + \frac{n_2}{\sigma_2^2}}$$

APPENDIX G:

REGRESSION ANALYSIS 1—CORRELATION MATRIX

	1 English prior ach	2 English se	3 gender	4 race/ ethnic	5 parent ed	6 field	7 adv	8 intro	9 curr
1	—								
2	.19*	—							
3	-.06	-.10	—						
4	-.22*	.08	.04	—					
5	.36*	.08	.01	-.19*	—				
6	-.25*	-.06	.02	.06	-.08	—			
7	.10	.06	.05	.06	.07	.17*	—		
8	-.21*	.01	-.07	.14*	-.04	.28*	.22*	—	
9	-.04	.06	.05	-.07	-.03	.23*	.30*	.21*	—

Note: *Correlation is significant at the .05 level, two-tailed.

APPENDIX H:

REGRESSION ANALYSIS 2—CORRELATION MATRIX

	1 English prior ach	2 English mot	3 gender	4 race/ ethnic	5 parent ed	6 field	7 adv	8 intro	9 curr
1	—								
2	-.04	—							
3	-.06	-.27*	—						
4	-.22*	.05	.04	—					
5	.36*	.02	.01	-.19*	—				
6	-.25*	-.00	.02	.06	-.08	—			
7	.10	.07	.05	.06	.07	.17*	—		
8	-.21*	.08	-.07	.14*	-.04	.28*	.22*	—	
9	-.04	.02	.05	-.07	-.03	.23*	.30*	.21*	—

Note: *Correlation is significant at the .05 level, two-tailed.

APPENDIX I:

REGRESSION ANALYSIS 3—CORRELATION MATRIX

	1 math se	2 math prior ach	3 gender	4 race/ ethnic	5 parented	6 field	7 adv	8 intro	9 curr
1	1								
2	.40*	1							
3	.11	-.02	1						
4	-.05	-.22*	.04	1					
5	.10	.26*	.01	-.19*	1				
6	-.02	-.19*	.02	.06	-.08	1			
7	.15*	.11	.05	.06	.07	.17*	1		
8	-.01	-.12*	-.07	.14*	-.04	.28*	.22*	1	
9	-.01	.01	.05	-.07	-.03	.23*	.30*	.21*	1

Note: *Correlation is significant at the .05 level, two-tailed.

APPENDIX J:

REGRESSION ANALYSIS 4—CORRELATION MATRIX

	1 math prach	2 gender	3 race/ethnic	4 parented	5 field	6 adv	7 intro	8 curr	9 math mot
1	—								
2	-.02	—							
3	-.22*	.04	—						
4	.26*	.01	-.19*	—					
5	-.19*	.02	.06	-.08	—				
6	.11	.05	.06	.07	.17*	—			
7	-.12*	-.07	.14*	-.04	.28*	.22*	—		
8	.01	.05	-.07	-.03	.23*	.30*	.21*	—	
9	.04	.08	.05	.04	.03	.19*	.12*	-.04	—

Note: *Correlation is significant at the 0.05 level, two-tailed).

TABLES

Table 1

Intervention Participation Rates

Intervention	Participation (%)
Career major	18.2
Career mentor	04.4
Job shadowing	12.5
School-based enterprise	08.9
Tech prep	07.6
Cooperative education	06.7
Internships	04.3
No career program	69.0

Note. Table created from data drawn from Delci & Stern (1999).

Table 2

Prior Achievement Descriptive Statistics

	N	Range	*M*	*SD*
Math prior achievement	293	2–99	59.35	21.29
Reading prior achievement	293	1–99	59.31	20.72

Table 3

Episodic Interventions—Individual Level

	N	Range	Taxon	*M*	*SD*
Info infused	293	0–44.00	Curriculum	9.10	31.02
Skills infused	293	0–43.00	Curriculum	8.97	31.43
Computer	293	0–40.00	Advising	2.63	4.63
Internship	293	0–6.00	Field	2.08	13.71
Academic plan coun	293	0–55.00	Advising	1.90	3.99
Recruiting	293	0–25.00	Advising	1.87	2.66
Interests testing	293	0–9.00	Advising	1.74	1.34
Job shadow	293	0–49.00	Field	1.71	5.28
Personal/social coun	293	0–48.00	Advising	1.57	4.60
Guidance lesson–P/S	293	0–35.00	Introductory	1.38	3.73
Career coun	293	0–53.00	Advising	1.36	3.90
Aptitude testing	293	0–15.00	Introductory	1.34	1.59
Guidance lesson–CD	293	0–18.00	Introductory	1.32	2.33
Job hunting skills	293	0–10.00	Advising	1.31	1.77
Library/career ctr	293	0–23.00	Advising	1.24	2.24
Career maturity test	293	0–26.00	Advising	1.21	2.04

Table 3 (continued).

Members teach	293	0–27.00	Introductory	1.15	2.42
Career pathway	293	0–4.00	Advising	1.14	2.22
Admissions testing	293	0–7.00	Advising	1.07	1.39
Career day/fair	293	0–6.00	Introductory	.83	1.27
Guidance lesson–AP	293	0–10.00	Introductory	.83	1.63
Info interviewing	293	0–10.00	Advising	.77	1.27
Work-based project	293	0–25.00	Field	.77	2.27
Field trip	293	0–12.00	Introductory	.70	1.32
Parent/student conf	293	0–10.00	Advising	.62	1.29
Career portfolio	293	0–8.00	Advising	.59	1.07
Career map	293	0–14.00	Advising	.49	1.30
Peer advisor	293	0–8.00	Advising	.48	1.27
Career mentor	293	0–4.00	Field	.36	1.71
Job coach	293	0–9.00	Field	.33	1.18
Job placement	293	0–7.00	Field	.26	.81
Referral–ext training	293	0–4.00	Advising	.20	.60
Referral–ext coun	293	0–3.00	Advising	.10	.41

Note. Improbable outliers on the high end of the range were eliminated in this Table. "Coun" is an abbreviation for Counseling.

Table 4

Academic Term Interventions—Individual Level

	N	Range	Taxon	*M*	*SD*
CTE course	293	0–8.00	Curriculum	1.03	1.98
Dual enroll	293	0–8.00	Advising	.82	1.43
School-based enterprise	293	0–8.00	Curriculum	.81	1.87
Clubs	293	0–8.00	Curriculum	.67	1.66
Passport	293	0–8.00	Advising	.45	1.26
Co-op education	293	0–5.00	Field	.38	.95
Service learning	293	0–8.00	Field	.36	1.12
Work study	293	0–6.00	Field	.27	.77
Magnet school	293	0–5.00	Curriculum	.18	.72
Youth apprenticeship	293	0–6.00	Field	.17	.77
Tech prep	293	0–4.00	Curriculum	.13	.64

Table 5

Episodic Interventions—Taxon Level

	N	Range	*M*	*SD*
Curriculum	293	0–88.00	9.04	30.64
Advising	293	0–56.00	1.13	1.07
Introductory	293	0–28.00	1.08	1.09
Field	293	0–33.00	.92	3.27

Table 6

Academic Term Interventions—Taxon Level

	N	Range	*M*	*SD*
Advising	293	0–5.00	.63	.97
Curriculum	293	0–3.80	.56	.76
Field	293	0–3.25	.29	.56

Table 7

Criterion Variable Descriptive Statistics

	N	Range	*M*	*SD*
Math self-efficacy	293	5.00–25.00	17.37	4.87
English self-efficacy	293	9.00–20.00	16.25	2.58
English motivation	293	7.00–20.00	15.80	2.96
Math motivation	293	5.00–20.00	13.99	3.64

Table 8

English Self-Efficacy Regression Results

	Standardized Beta	*t*	Sig.	*R*	R^2	R^2 Change
constant		29.95	*			
English prior achievement	.22	3.81	*	.19	.03	.03
Race/ethnicity	.13	2.29	* *	.23	.04	.01

Note: * $p < .00$. ** $p < .05$.

Table 9

English Motivation Regression Results

	Standardized Beta	*t*	Sig.	*R*	R^2
constant		69.93	*		
Gender	-.27	-4.87	*	.27	.07

Note: * $p < .00$.

Table 10

Mathematics Self-Efficacy Regression Results

	Standardized Beta	*t*	Sig.	*R*	R^2	R^2 Change
constant		13.84	*			
Math prior achievement	.40	7.50	*	.39	.15	.15
Gender	.11	2.20	**	.41	.17	.02

Note: * $p < .00$. ** $p < .05$.

Table 11

Mathematics Motivation Regression Results

	Standardized Beta	*t*	Sig.	*R*	R^2
constant		52.55	*		
Advising taxon	.19	3.32	*	.19	.04

Note: * $p < .00$.

Table 12

Intervention Participation Rate Comparisons

Intervention	National Rate (%)	Current Study (%)	Binomial Test (%)
Career major[a]	18.20	59.40	$p < .00$
Career mentor[a]	04.40	15.40	$p < .00$
Job shadow[a]	12.50	53.20	$p < .00$
School-based enterprise[a]	08.90	21.50	$p < .00$
Tech prep[a]	07.60	05.50	$p < .00$
Cooperative education[a]	06.70	18.10	$p < .00$
Internship[a]	04.30	34.80	$p < .00$
No career program[a]	69.00	21.30	$p < .00$
CTE course[b]	97.00	31.10	$p < .00$

Note: [a] National data from Delci & Stern (1999). [b] National data from Levesque et al. (2000). One-tailed asymptotic significance was used.